COAL AGE

Volume 14 New York, December 12, 1918 *Number* 24

That We May Continue Joyful

THANKSGIVING day has come—and gone. We have offered our thanks for a bountiful harvest; but that bounty of nature, cut and garnered, will do us little good if by lack of care we let it heat, sour and spoil. We have rendered thanks for the victories of the war, but we must never forget that what is gained by valor is often lost by poor diplomacy and the mutual jealousies of the victors.

ABOVE all, we gave thanks for the new spirit of mutual understanding, perhaps the best gift of the war and also the most fleeting. That unity of hearts may well disappear as mysteriously as it came. The war found capital and labor organized into bodies to wage an economic conflict, but the contending parties quickly forgot their old enmities as they became absorbed in their new duties. The keynotes of the war are not hatred and violence, but rather mutual respect and helpfulness.

LET us be careful lest this good grain garnered in generous measure, but carelessly housed, furnish us with nothing but impotent regrets. We have learned since the war so much as to the essential uprightness of all men—manual laborers, mental workers and capitalists. We have acquired a generosity which has surprised us all. We have renewed our beliefs in the importance of all those things the value of which cannot be expressed in money.

We have seen that under favorable conditions there are the possibilities of good in all assemblies of men, whether the men thus assembled form labor unions or employers' associations. The generous spirits of men refuse to permit them to confine their discussions to the promotion of their selfish interests. We have learned that if we only appeal to the good, that the good is there; that the making of agreements can be such a pleasant occasion as to be the source of friendships rather than the occasions of embitterment. We have been surprised by the small part played during the war by narrow self-interest.

We have seen the influenza come and take nearly six times as many victims as the war, and from that fact we have learned how important is medical attention and universal education in the art of prophylaxis. We have learned the dangers of having a population of foreigners which we have done little to welcome and nothing to educate. We have been encouraged by the patriotism of the alien and by his ready appreciation of the little we have done to win him.

LET us keep all we have gained, every foot of the spiritual domain we have conquered, all the joy of giving, all the democracy, all the faith in others, all the largeness of vision, all the depth of our Americanism, all the pleasure of our larger world consciousness. The things which the war has given us are big, the biggest of all things. We have drunk deep of the new elixir of life. Let us not willingly go back to the small beer of the days before the war—to its squabbles, its doubts, its meannesses and its animosities. Thanks to the Germans, we have learned how bad is evil and how glorious is our heritage of kindliness and good will.

Use and Abuse of Electric Headlights on Mining Locomotives*

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THREE different types of headlights are in use on mining locomotives today, and each has certain characteristics peculiar to its type. A thorough understanding and application of these characteristics will overcome most headlight troubles. There is nothing mysterious about a headlight. It is simpler than the motors, controller, wiring, etc., which comprise the electrical equipment of a mining locomotive, but it seems to be abused more than all the rest of the machinery combined. It is unfortunate that not only the motormen but even the men who couple cars consider themselves competent to "fix" headlights instead of leaving that to the shop electricians.

The luminous arc headlight possesses the inherent advantage of high illuminating efficiency, owing to the composition of the lower electrode. It is the most efficient of all types of headlights commercially available, unless it is possible to operate the extremely low voltage, high-current Mazda lamps, such as the 6-volt, 18-amp. lamp. The maintenance cost of this headlight is low, since it requires no inclosing globe for the arc and the upper electrode is practically non-consuming, while the lower electrode has a life of from 125 to 150 hours of burning.

Owing to the fact that the upper electrode is practically non-consuming, the arc is always maintained at the focal point of the lens or reflector. Adjustment of this upper electrode is necessary only once in two or three months' time.

A headlight of this type has the disadvantage that a certain amount of fumes that must be wiped away are given off from the arc, and the headlight is not quite so simple as an incandescent headlight because it has several moving parts. One other disadvantage which it possesses in common with all arc headlights is that the natural travel of the arc around the electrodes causes the beam to wander slightly from side to side, but its many advantages more than offset these.

One of the greatest causes of poor illumination from luminous arc headlights is improper care of the upper

*Paper presented before the Coal Mining Institute of America, at Pittsburgh, Penn., Dec. 5, 1918.

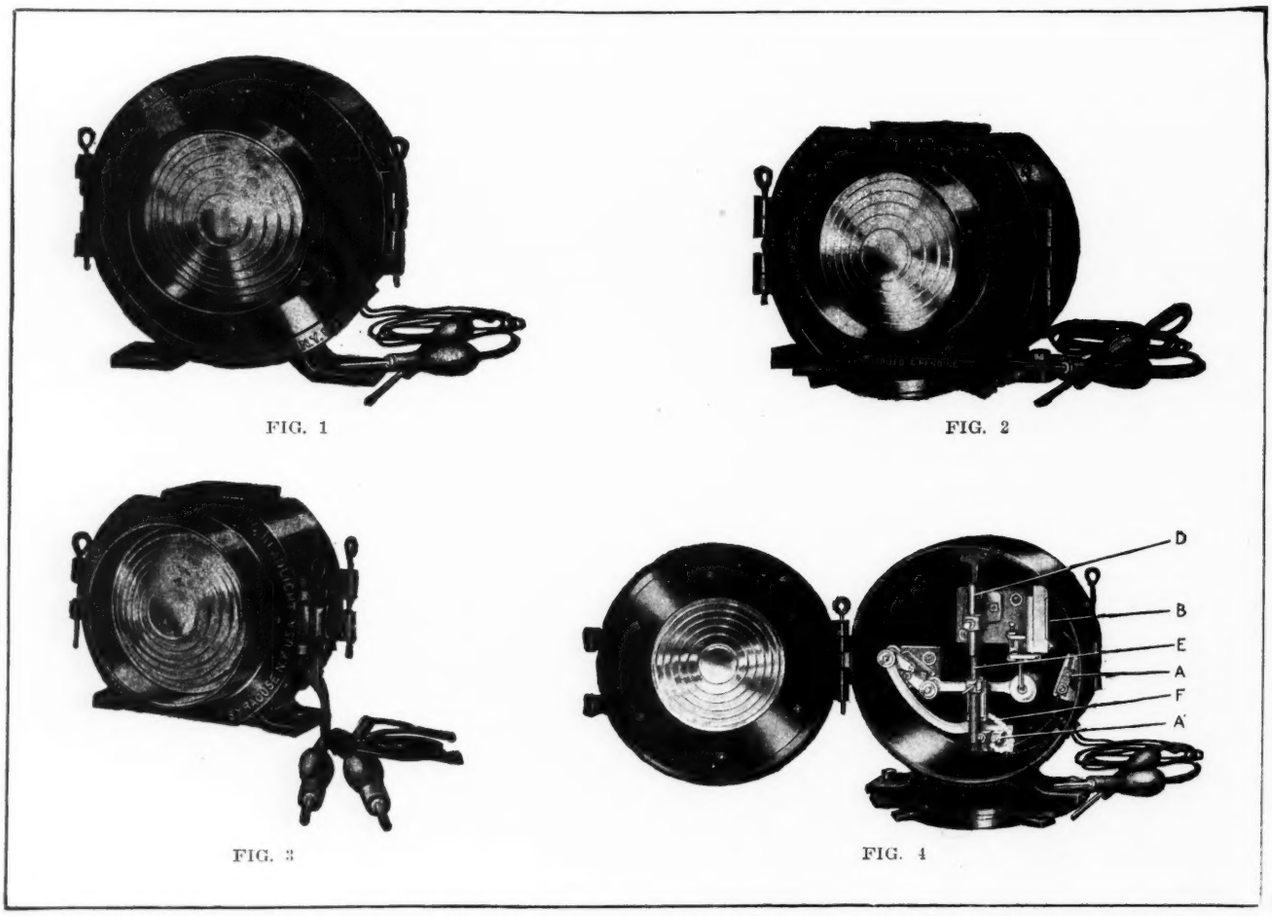

FIG. 1 FIG. 2

FIG. 3 FIG. 4

FIGS. 1 TO 3. VARIOUS TYPES OF LUMINOUS ARC HEADLIGHTS. FIG. 4 SHOWS INTERIOR OF A SINGLE-COMPARTMENT LUMINOUS ARC HEADLIGHT

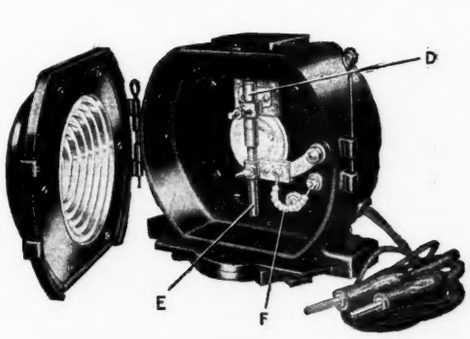

FIG. 5

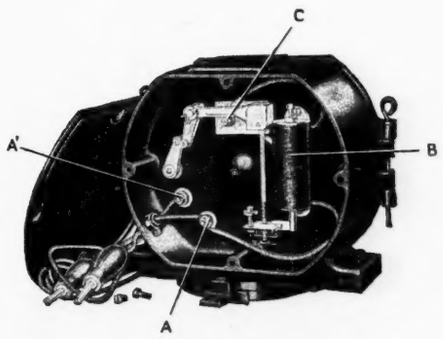

FIG. 6

FIGS. 5 AND 6. ARC COMPARTMENT AND MECHANISM COMPARTMENT OF LUMINOUS ARC HEADLIGHT

electrode. This electrode should be adjusted once in every two or three months' time, but I have seen cases where they have not been adjusted for perhaps a year. This means that the upper electrode is burned away from $\frac{1}{2}$ to $\frac{3}{4}$ in. and the arc is struck that distance above the center line of the headlight, resulting in poor track illumination.

The result of this inattention to the seemingly unimportant headlight is obvious to all, and I have seen headlights operating under conditions which would bid fair to lay up a locomotive if another piece of the equipment upon it were run in a similar manner.

The earlier forms of luminous arc headlights were of the single compartment type; that is, the arc and mechanism were in the same compartment (see Fig. 4). Later development brought out the two-compartment headlight (Figs. 5 and 6). Fig. 5 shows the front compartment containing the electrodes, between which the arc is struck. This compartment is hermetically sealed from the rear compartment (Fig. 6), which contains all the operating mechanism. In this type of headlight the fumes given off by the burning arc cannot accumulate on the mechanism parts. Therefore, the headlight works more freely and gives practically no trouble from a "sticky" mechanism. The chief advantage of this two-compartment headlight is that the mechanism is out of the way and, therefore, unauthorized persons are not so liable to tamper with it. This advantage sometimes works to a disadvantage, for when major repairs are necessary, the headlight must be entirely removed from some locomotives, because it is mounted too close to the frame to permit repairs to be made. Notwithstanding this, the two-compartment headlight has proved more reliable and more economical than the single-compartment headlight.

The connections are traced as follows (see Figs. 5 and 6): Starting at binding post *A*, the positive side, the current flows through the magnet coil *B* and then to the insulated stud *C*, through the partition. This insulated stud connects directly with the upper electrode *D*. Current then flows through the lower electrode *E* to the flexible connector *F*, to the negative terminal post *A*. It is essential that these connections be observed, particularly the polarity.

The external connections are simple, as everything is connected in series. The circuit runs (Figs. 7 and 8) from the trolley through a protecting fuse and a resistance to the contact switch, which may be either one-way or two-way, according to whether one or two headlights are used per locomotive. From this switch current flows through the headlight back to a negative receptacle, which is grounded. Plugs and receptacles have been found advantageous for connecting the headlight to the circuit since it is then possible to change to the proper headlight polarity, if the trolley for any reason becomes negative.

The headlight is shipped from the factory carefully adjusted for proper operation. If repairs are necessary, the mechanism should be readjusted as follows: First of all, loosen the magnet stop screw *C* (Fig. 9) and raise it so that it will clear the top of the armature *B*. Lift the armature *B* with the finger until the clutch *D* engages the stop *E*, and then raise or lower the clutch stop *E* until the arc length is from $\frac{5}{16}$ to $\frac{3}{8}$ in. The arc length may be measured (not guessed at) from the back by measuring the distance between the bottom of the clutch *D* and the top of the support *F*.

A final check should be made by actually measuring the arc length itself in the front compartment. Still holding the armature *B* so that the clutch *D* strikes its stop *E*, the magnet stop screw *C* should be lowered until it touches the top of the armature *B*—a slight pressure on the armature will give evidence of this touching.

Now back the screw *C* out about a half to a full turn and lock it in place. There must be a slight clearance between the bottom of the screw *C* and the top of the armature *B*. To be sure there is a clearance, let the armature *B* drop and raise it again, first holding a piece of tissue paper between the clutch *D* and its stop *E*. When the armature *B* is held in the top position the tissue paper should be held tightly between the clutch *D* and its stop *E* and should tear rather than pull out.

The idea is to obtain the proper arc length, with the clutch *D* striking its stop *E*, and then to have a slight clearance between the armature *B* and the stop screw *C*. If this clearance is too great, it will materially weaken the pull of the magnet, particularly at low voltages.

In order that the arc may be in the focal point of the lens, the bottom of the upper electrode should be $1\frac{1}{2}$ in. from the lower edge of the holder in Types MLD and

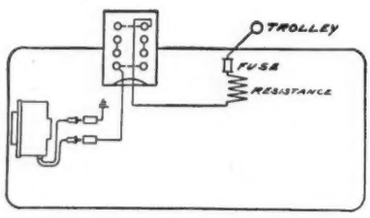

FIG. 7

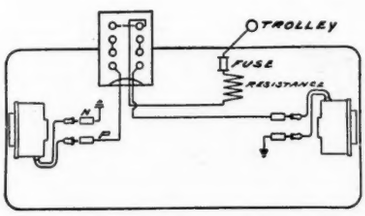

FIG. 8

FIGS. 7 AND 8. DIAGRAMS OF CONNECTIONS EMPLOYED WITH STATIONARY HEADLIGHTS
Fig. 7—Wiring diagram for stationary headlight with single-end equipment. Fig. 8—Wiring diagram for stationary headlight with double-end equipment

MLK headlights, while in Types ML and MLF this distance should be 1¼ in. The lower electrode should be so placed that its upper end is 1 to 1¼ in. above the upper edge of its holder. The proper knowledge and application of these adjustments will insure satisfactory operation of the headlight.

When the current is off, the electrodes are together. At the instant the current is switched on, the magnet coil is energized and lifts the armature. This motion is carried through the clutch rod to the mechanism and the arc is struck and maintained. The arc length remains practically constant since the rate of consumption of the electrodes is slow. Natural circuit interruptions, such as circuit breakers, sectionalizing switches, etc., cause the arc to break often enough to prevent its becoming too long.

The electrodes of luminous arc headlights burn a long time. The upper, positive electrode is made of copper and has a life of 3000 hours. Every two or three months it should be adjusted so that its lower face is the proper distance from the bottom of its holder. The lower, negative electrode has a life of 125 to 150 hours on 4-amp. headlights and 200 to 225 hours on 2-amp. headlights, and after ten hours' burning should be adjusted so that the burning end of the electrode is 1¼ in. from the top of its holder.

The arc voltage is 80 in both the 4-amp. and the 2-amp. headlights, and the difference between the arc voltage and the line voltage is taken up in the dead resistance which is connected in the circuit. To insure the proper arc voltage it is only necessary to keep the arc $\frac{5}{16}$ to $\frac{3}{8}$ in. in length.

The upper copper electrode is positive and the lower electrode negative. This polarity should be maintained. A reversal of polarity will mean poor operation, since the arc will be dim and unstable. Every arc is characteristic of its negative electrode. In the luminous arc headlight the negative electrode is a magnetite composition which burns with a brilliant white light.

When a new lower electrode is put in the headlight, it should be burned for about 5 min. before being sent out on a trip. This time is necessary to burn off the iron cap on top of the electrode, during which period the arc is somewhat unstable. Two leads with plugs are furnished with all luminous arc mining headlights so that proper polarity may be maintained at the headlight regardless of trolley polarity.

The headlight casing is ventilated and the air outlet so baffled that the arc cannot be blown out nor can rain beat in. On top of the casing is a ventilator, at the back of which is a long narrow opening. As the locomotive runs along, the air rushing past the sides of the headlight creates a partial vacuum in the ventilator, thereby causing the fumes to flow out of the casing.

About once a day the headlight should be cleaned; that is, the deposit from the electrodes should be wiped or blown from the lens and casing. In nearly every car shop compressed air is available, and this can be used to good advantage in blowing the deposit away. The mechanism entirely in the rear compartment should be kept free, but no oil should be used. The front door should be kept closed always and a broken lens replaced immediately. This is to prevent wind from blowing out the arc. A test for free operation of the mechanism is to switch the current on and then off again. The lower electrode will immediately come up against the upper with some little force.

Carbon arc headlights have the advantage of low initial cost and also that no fumes are given off by the arc to depreciate the reflector or lens. They are a reliable headlight and will operate for long periods of time with practically no attention to the operating mechanism. However, the lower efficiency of these headlights as well as the higher maintenance cost as compared with the luminous arc headlights, have caused them to take a position of secondary importance on

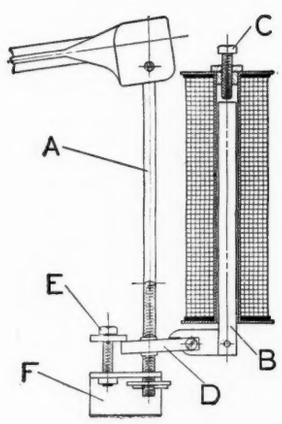

FIG. 9

FIG. 9. CLUTCH MECHANISM OF LUMINOUS ARC HEADLIGHT

haulage motors. This high maintenance cost is due to short-life electrodes and the necessary inclosing globe. Since both the upper and lower electrodes are consumed during the burning of the arc, it is necessary that the arc be readjusted to the focal point of the reflector every two or three hours. This adjustment is accomplished by moving the lower electrode up to its original position.

The carbons in all 4-amp. headlights burn 30 to 40 hours before they have to be renewed. In the 2-amp. headlights the carbons burn 50 to 60 hours. Only straight, fine-grained carbons should be used.

The inclosing globe is made of heat-resisting glass, carefully annealed to prevent cracking or melting. The ends are ground to insure perfect fit against globe seat and cap.

Figs. 14 and 15 show the external connections usually employed with carbon arc headlights. These connections are simple, since everything is connected in series. The circuit runs from the trolley through a protecting fuse and a resistance to the control switch, which may be either one-way or two-way, according to whether one or two headlights are used per locomotive. From this switch the current passes through the headlight to the ground.

The following adjustments are carefully made at the factory before headlights are shipped, and they should be maintained when making repairs. In the vertical carbon headlight the clutch picks up against the spacing bushing *Q* (see Figs. 16 and 17), which regulates the length of the arc. The stop screw *S* is adjusted so that there is a slight clearance between it and the top of the armature *C*. This adjustment is secured by holding the armature *C* up and moving the screw *S* down until it touches the top of the armature, and then backing the screw out a half to a full turn and locking it in place.

When replacing the reflector or the magnet coil *N*, care must be taken to see that the reflector does not touch the upper electrode holder. This can only come about through a variation in castings. To compensate for this variation the entire mechanism may be rocked slightly by means of the screws *T* and *T'*. When replacing the magnet coil *N*, the yoke must fit the coil head snugly. If the coil is allowed to "ride up," it may not center itself around the armature. It is always a good plan to bend the ends of the yoke together and spring them apart when putting the coil in place.

The internal connections of the headlight are simple and should be observed. The positive plug of the arc circuit terminates at the binding post *A*, to which is also connected one end of the magnet coil. From the other side of the magnet coil the current flows through the upper carbon to the lower carbon. The knurled wheel *K* is under spring tension and bears directly on the lower carbon. The entire lower carbon-holder is grounded. (See Figs. 16 and 17.)

In the Type M carbon arc headlights the arc current is from 4 to 4½ amp., and in Types V and VR headlights the current is from 2 to 2½ amp. The arc voltage of all headlights is 70 to 80 volts. To maintain this arc voltage it is only necessary to keep the arc length $\frac{3}{16}$ to $\frac{1}{4}$ in. The difference between the arc voltage and the line voltage is taken up by a dead resistance connected in the circuit.

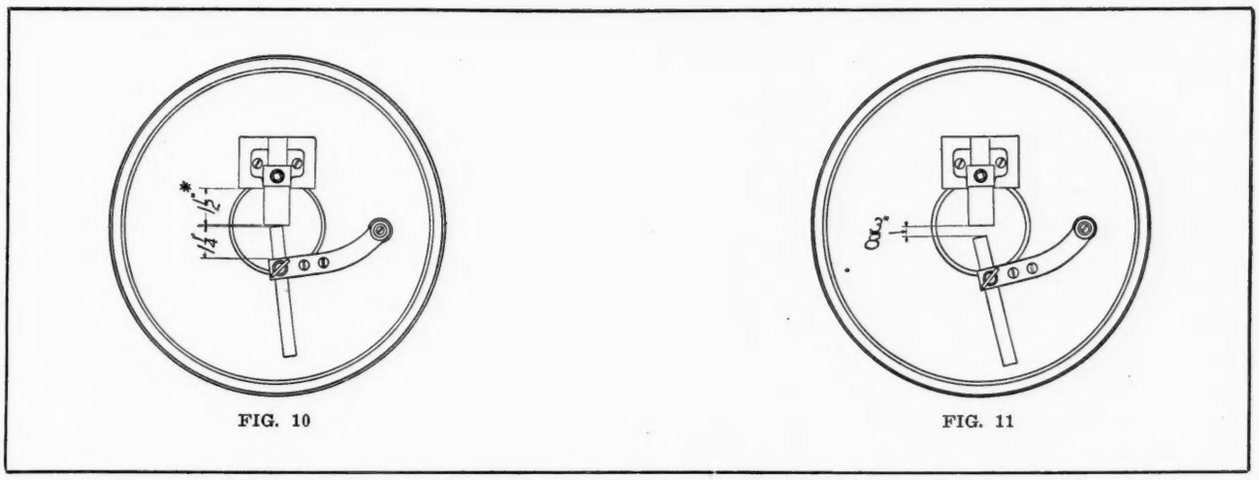

FIG. 10

FIG. 11

FIG. 10. ELECTRODE SETTING OF LUMINOUS ARC HEADLIGHT. FIG. 11. SHOWS ARC LENGTH OF LUMINOUS ARC HEADLIGHT

When the current is off, the two carbons are together. At the instant the current is switched on, the magnet coil is energized and lifts the upper carbon $\frac{3}{16}$ to $\frac{1}{4}$ in., thereby striking an arc between it and the lower carbon. The position of the lower electrode is fixed. Natural circuit interruptions, such as circuit breakers, sectionalizing switches, etc., cause the headlight to feed often enough to prevent the arc from becoming too long. If the headlight is left burning when the locomotive is standing still, the circuit should be broken at least once in 30 min. As the carbon burns away, the position of the arc changes—that is, it burns down out of focus. After about two hours' burning, the headlight should be refocused by turning the thumb wheel *B*. This should be done only when the current is turned off, because when the current is on the upper carbon is held up, and moving the lower carbon only increases or decreases the length of the arc.

A trimming gage (Fig. 18) is shipped with each headlight. This is to be used in properly focusing the arc. For this operation the upper carbon is removed and the trimming gage put in the holder until the shoulder rests against the top of the carbon-holder. The

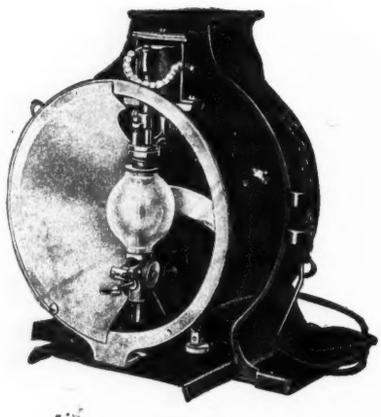

FIG. 12

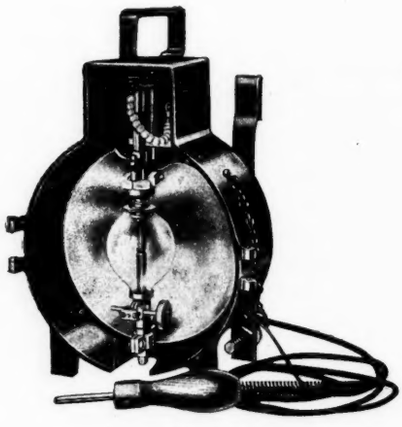

FIG. 13

FIGS. 12 AND 13. TWO TYPES OF CARBON ARC HEADLIGHTS

lower carbon should then be moved up until its top strikes the bottom of the trimming gage. After a little practice, however, the arc may be focused by the eye; that is, by simply moving the lower carbon until the narrowest obtainable beam of light is thrown down the track.

In all carbon arc headlights the upper carbon is positive and should be kept so. The headlight is so adjusted that when the arc is struck the tip of the upper positive carbon is at the focal point of the reflector. For the most part, the light of the carbon arc comes from the crater of the positive carbon, the actual light distribution being as follows: Upper (positive) carbon, 70 per cent.; lower (negative) carbon, 25 per cent.; arc stream, 5 per cent. If the polarity of the arc were reversed and the upper carbon made the negative side of the line, the arc would be out of focus.

In all carbon arc headlights the carbons may be renewed or adjusted without disturbing the globe, and, with the exception of Types V and VR, each headlight has its entire mechanism mounted on a frame which slides out of the headlight casing. These sliding mechanisms are moved forward a little for trimming. The stub of the upper carbon *G* (Figs. 16 and 17) is taken out of the top of its holder by simply lifting it. The lower carbon *H* is removed by turning the thumb wheel *B*. The lower carbon should be inserted first and adjusted to its proper position; the trimming gage shown in Fig. 18 should be used at this point, and should be put in the upper carbon-holder and the lower carbon moved up until its tip touches the bottom of the gage. Then the upper carbon should be inserted and the flexible conductor *F* slipped over its top. This flexible conductor shcuild always be used as it insures positive electrical contact at all times. The use of this flexible conductor is necessary because no dependence can be placed on the sliding contact between the carbon and its holder. When the flexible cable is used there can be no arcing between the carbon and holder. This flexible cable must not dangle loosely against the reflector, since the cable is the positive and the reflector the negative side of the line. In Types V and VR headlights the mechanism is permanently attached to the back of the casing and therefore will not slide out. In these headlights both the upper and lower carbons are removed through the lower carbon-holder. Both carbons are released quickly by pulling outward on the shaft *K* of the thumb wheel *B* (Figs. 16 and 17). In renewing the carbons, the upper one should be put in first and moved up by turning the thumb wheel *B* until its top enters the upper carbon-holder, and then the lower should be put in. The lower one will raise the upper carbon to its proper position. In all headlights in which the carbons are vertical, the stub of the consumed carbon is the right length to be used as the lower carbon for the new trim.

In order to remove the globe *E* for cleaning, it is only necessary to lift the globe cap *I* against its spring and move the lower end of the globe forward. The carbons

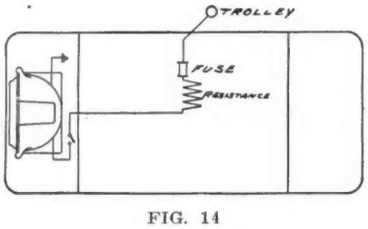

FIG. 14

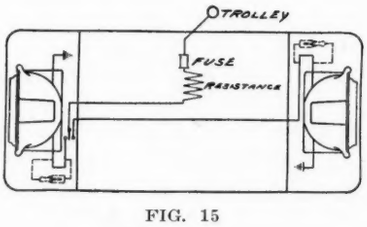

FIG. 15

FIGS. 14 AND 15. DIAGRAMS OF CONNECTIONS EMPLOYED WITH CARBON ARC HEADLIGHTS
Fig. 14—Wiring diagram for headlight with single-end equipment. Fig. 15—Wiring diagram for headlights with double-end equipment

must be removed before taking out the globe. In replacing the globe, be sure that it fits true on its seat, so as to exclude air. The top and bottom openings of the globe are parallel ground faces and seat against machined surfaces. The headlight should not be operated without a globe or with a broken globe; to do so shortens the life of the carbons.

It is occasionally necessary to polish the reflector, and this should be done carefully. If a cotton buffing wheel is available, use it; if not, the reflector may be buffed by hand. First, dust it out lightly with cotton waste and then rub with clean chamois skin. The lint side of canton flannel may be used. Always rub a reflector radially from the outer edge toward the center.

The incandescent headlight possesses the advantage of extreme simplicity and steadiness, and, in the smaller sizes, the maintenance cost is somewhat less than that of arc headlights, though if a large incandescent lamp is used which gives an illumination comparable with a good arc headlight, the item of expense for lamp renewals is apt to be considerably greater than the entire maintenance expense of an arc headlight. As mentioned before, an incandescent lamp, whether it is used in a headlight or not, is highly susceptible to fluctuations in potential, since the illumination varies as about the cube of the voltage.

The incandescent headlight is considerably more fragile than the arc headlight, and the constant vibration to which incandescent lamps are subjected in actual service makes them uncertain for mining work.

The question of voltage variation of the trolley is one which governs to a certain extent the selection of a headlight. Arc headlights operate much more satisfactorily under wide variations than do incandescent headlights. It is not uncommon for an arc headlight to operate satisfactorily on trolley circuits varying from 675 to 250 volts where the average is 550. This means that the headlight will withstand about 25 per cent. over-voltage and will operate on 45 per cent. of normal voltage. The reduction in candlepower of the arc is about proportional to the 1.5 power of the reduction in voltage. The incandescent headlight will not withstand as wide a variation in potential as will the arc.

Every incandescent lamp has a label on which its proper voltage and wattage are indicated, and to secure the best results from every standpoint it should be operated at this rating. In mining work it is impossible to operate the incandescent lamp at its labeled voltage all the time, owing to the wide variations in trolley potential, but the average voltage conditions should be determined and the headlight lamp and its resistance should be designed for this pressure. If there is a wide

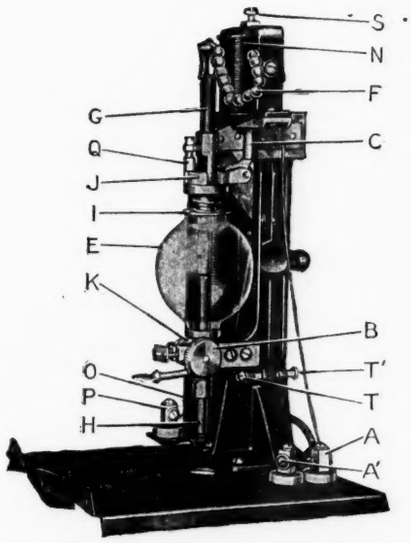

FIG. 16

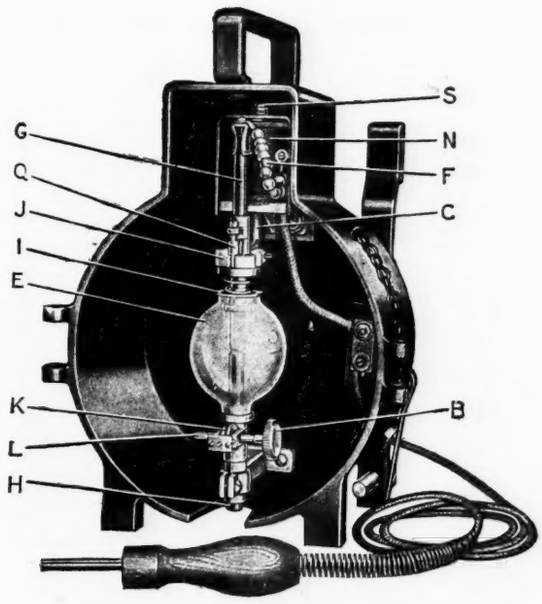

FIG. 17

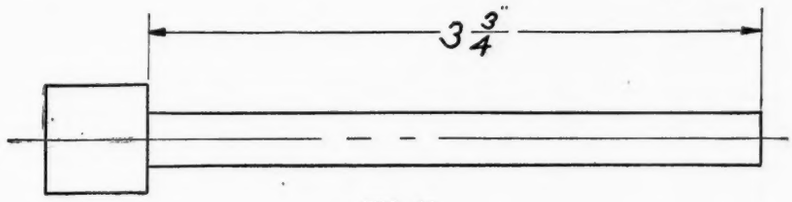

FIG. 18

FIGS. 16 AND 17. MECHANICAL DETAILS OF CARBON ARC HEADLIGHTS. FIG. 18 SHOWS TRIMMING GAGE USED FOR FOCUSING THE ARC

FIG. 19

FIG. 20

FIG. 21

FIGS. 19 TO 21. VARIOUS TYPES OF INCANDESCENT HEADLIGHTS

difference between the average and the maximum line voltage the lamp must be operated nearer the maximum, say within 5 per cent. of the maximum. If the lamp is operated below the normal voltage the amount of light will be greatly reduced, as shown in the accompanying curve (Fig. 22)[1], which emphasizes the necessity of burning the lamp at its proper voltage if the lamp is to give its rated light. Fig. 23 shows the variation in candlepower of an arc headlight with variation of arc current. The arc is considerably less susceptible to changes in current.

On the other hand, operating incandescent lamps at any voltage above the normal is detrimental. Overvoltage increases the efficiency of the lamp but reduces its life considerably, and too high a percentage of overvoltage will burn out the lamp filament entirely. This is particularly true of Mazda C lamps.

A great many different kinds of reflectors are used in headlights and a discussion of their relative merits may be of value. From a standpoint of efficiency for light projection, the following tabulation is given; the reflector with the highest coefficient of reflection is placed at the top of the list.

	Coefficient of Reflection,* Per Cent.
1. Silver plated copper	90
2. Clear plate glass mirror	83
3. Canary glass mirror	79
4. Polished aluminum	67
5. Nickel plated copper	64

*W. F. Little. Electrical Testing Laboratories.

The coefficient of reflection, however, is not the only thing to be considered in selecting a reflector, and the following list is given based upon the permanency of the reflecting surface:

1. Clear glass and canary glass.
2. Nickel plated copper.
3. Polished aluminum.
4. Silver plated copper.

As is perfectly natural, these various reflectors have a different initial cost and the third arrangement is given based upon this item, the lowest in cost being placed first:

1. Polished aluminum.
2. Nickel plated copper.
3. Silver plated copper.
4. Clear glass.
5. Canary glass.

[1]Curve taken from Bulletin of National Lamp Works.

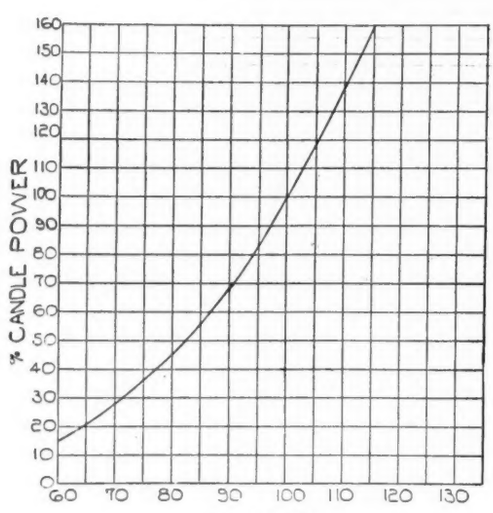

FIG. 22

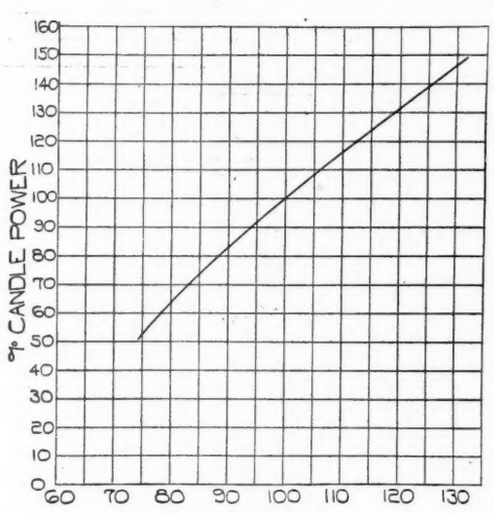

FIG. 23

FIG. 22. VOLTAGE-CANDLEPOWER CURVE OF INCANDESCENT LAMP. FIG. 23 SHOWS CANDLEPOWER-CURRENT CURVE OF LUMINOUS ARC HEADLIGHT

As has been set forth, there are three different light sources which are used in various headlights—the luminous arc, the carbon arc and the incandescent lamp. Without going into the theory of the arc formation, the light emitted by the luminous arc comes almost entirely from the arc stream. Since this is the case, larger diameter, long-life electrodes are used which are kept reasonably cool during the operation of the arc. In the carbon arc, at least 95 per cent. of the light emitted comes from the heated carbon tips, and by far the largest stream itself must be kept small and in the carbon arcs, the positive carbon tip must be kept small since this tip is placed at the focal point of the reflector.

In all headlights it is of the utmost importance that the primary light source shall be located as near the focal point of the reflector as possible. To illustrate the necessity of accurate focusing, a test was made using a 6-volt, 36-watt, focus-type Mazda lamp in a 16-in. diameter, 3-in. focus reflector. With the lamp $\frac{1}{16}$ in. ahead of the focal point, the intensity of the beam was

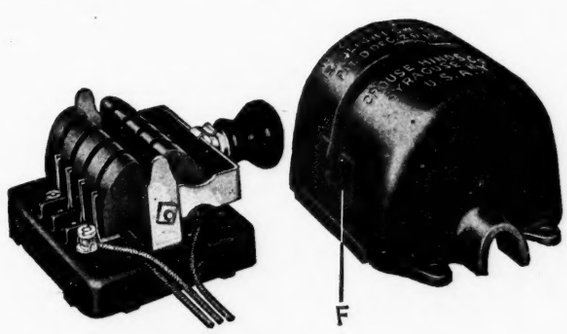

FIG. 24

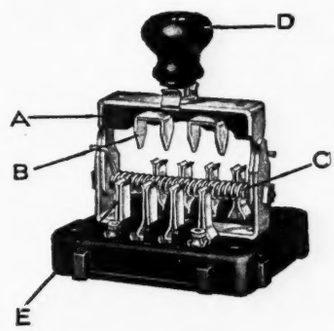

FIG. 25

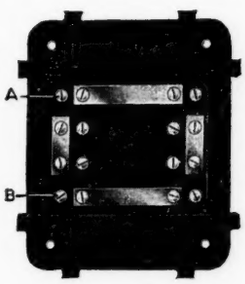

FIG. 26

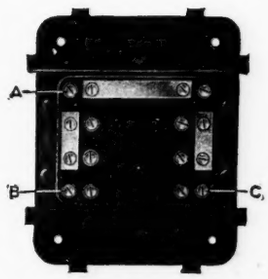

FIG. 27

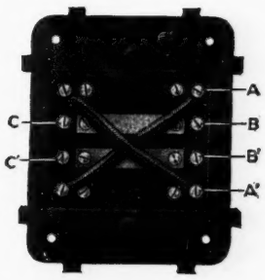

FIG. 28

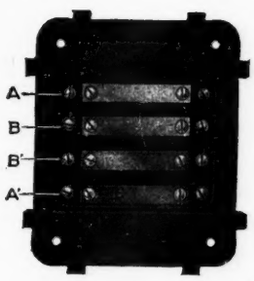

FIG. 29

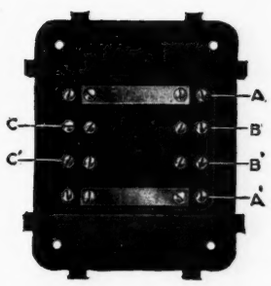

FIG. 30

FIGS. 24 TO 30. DETAILS OF VARIOUS TYPES OF MULTIPLE BREAK SWITCHES

percentage of the light comes from the white hot crater of the upper positive carbon. For this reason carbons of small diameter are used that they may be heated to a high intensity. With an incandescent lamp, all of the light comes from the incandescent filament and therefore the filament must be wound in as small a space as possible so that the angle of divergence of the beam may be only a few degrees. With a given reflecting or refracting medium, the volume of the light source determines the shape or rather the angle of divergence of the beam. In luminous arcs, this means that the arc reduced to 54 per cent. of the original intensity; $\frac{1}{8}$ in. ahead of the focal point, the intensity was reduced to 34 per cent. and $\frac{1}{4}$ in. ahead the intensity was only 6 per cent. of what it would have been if the filament were located at the exact focal point. The foregoing emphasizes strongly the necessity of accurate focusing of the light source. The light source in question was extremely small. In ordinary work it is impracticable to use light sources of these small dimensions; so the case cited above is somewhat exaggerated, but it serves

(*Continued on page 1079*)

Some Characteristics of American Coals in Byproduct Coking Practice—I*

By F. W. SPERR, JR.
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SYNOPSIS—*The products of the byproduct coke oven have a varying importance depending on the location of the oven plant and the demands of the times. At present coke is vital to the iron and steel industry; its byproducts are considered indispensable to the conduct of modern warfare. It would be difficult to do without coal tar derivatives and gas is valuable for light, heat and power. The striking power of a nation may be measured by its byproduct coke plants and its deposits of coal and iron. These and other facts are commented upon in a most interesting way by the author in the following article.*

BEFORE taking up the more technical phase of the subject it may not be amiss to discuss some of the broader relations of the American byproduct coke industry. The bulk of our material civilization during the past century has been built up by iron and energized by coal. These two are linked by coke. Next to the substitution of the shaft furnace for the old forge or bloomary, the greatest improvement in the iron industry was the substitution of coke for charcoal. It is difficult to realize that this important step was taken, with many misgivings, less than two centuries ago in England and less than 70 years ago in America. It was between 1730 and 1735 that Abraham Darby[1]—after six sleepless night, it is related—succeeded in making the first cast of iron from a coke-fed furnace in England. Other sporadic efforts had undoubtedly been made previous to that time, but it was then that a continuous development of the coke industry in England may be said to have started. On the continent of Europe the regular use of coke was not introduced until a number of years later, while in America it was not until 1850[2] that it began to exert an appreciable influence upon the manufacture of pig iron. In 1849 there was not a single coke furnace in blast in this country. Immediately after the Civil War, however, the demand for coke underwent a phenomenal development, at a rate which shows no signs of slackening. The coke industry is now truly regarded as an integral and vital part of the iron and steel industry. Not more than 110,000 tons[3] of coke were consumed in the production of pig iron in 1865. Twenty-five years later, in 1890, the annual consumption was about 10,000,000 tons. Fifty years later, in 1915, 36,700,000 tons of furnace coke and 1,700,000 tons of foundry coke were consumed. Last year (1917) the consumption of furnace and foundry coke was probably in excess of 50,000,000 tons. Thus in the past two years alone the industry has increased even more than in the phenomenal 25-year period preceding 1890.

Up to about 1893 the country was dependent upon beehive coke alone. Now please note that so soon after the establishment of the industry, when it had already attained an enormous growth and had so revolutionized the iron industry that coke instead of charcoal was recognized as the standard fuel for the blast furnace, even at this time men could foresee within a comparatively short period the same extinction that had virtually befallen the charcoal industry. Only a narrow range of coals can be used to make good metallurgical coke in the beehive oven. The supply of such coals was rapidly approaching exhaustion. In Belgium and Germany the exhaustion of beehive coals had begun to force the introduction of the byproduct oven, irrespective of any other economic considerations.

In a paper read a year ago, before The Franklin Institute, by C. J. Ramsburg,[4] there were brought forward three facts that are of great importance in this connection: (1) For every ton of coke made in the byproduct oven there is saved in fuel value alone the equivalent of 825 lb. of coal. (2) For every ton of coke made in the byproduct oven and applied to blast-furnace purposes there is a direct saving of 482 lb. of coal (200 lb. wasted in beehive oven + 282 lb. saved in blast furnace, due to the superiority of byproduct coke). (3) The byproduct oven, by reason of its great flexibility of control, enables us to make good metallurgical coke from a very wide range of coals.

Vital to Iron and Steel Industry

The development of the byproduct coke oven is as vital to the modern iron and steel industry as was the substitution of coke for charcoal. For all practical purposes it has indefinitely prolonged the life of this great business, because the new reserves of coking coal that it has opened up and that are actually in sight are far more than sufficient to take care of the estimated iron ore resources of the world.

The phase of any industry that vitally interests us nowadays is its relation to winning the war. Industrially and scientifically, only those subjects that have a bearing on this great problem should occupy our attention at this time. Let us consider this aspect of the byproduct coke industry. The vital connection of its main product—coke—with the iron and steel industry would alone suffice to place it in the front rank of the "essentials"; but, more than this, its byproducts are recognized as being indispensable to the conduct of modern warfare. One need only mention ammonia, the indispensable source of ammonium nitrate and the potential source of nitric acid; benzene; phenol; picric acid; napthalene with its mono-nitro derivative; cresol for antiseptic surgery; and, finally, toluene and trinitrotoluene, which is veritably the super-necessity of up-

*Presented at a meeting of the Franklin Institute held Mar. 20, 1918.

[1]Percy's Metallurgy (1864), p. 886.

[2]"Iron in All Ages," Swank, p. 370.

[3]Figures throughout this paper are in net tons, except where otherwise indicated.

[4]"Journal Franklin Institute," Vol. 183, 1917, p. 391. Reprinted in a series of articles in the Apr. 27 and May 4 and 11, 1918, issues of "Coal Age" under title of "Byproduct Coke and Coking Operations," by C. J. Ramsburg and F. W. Sperr, Jr.

to-date artillery. Besides these, there are a host of coal-tar derivatives, employed for military and surgical purposes, which it would be very difficult to do without. The byproduct coke oven is by far the largest source of these materials. Its relation to our toluene supply is of particular concern. Trinitrotoluene (TNT), which can only be produced from toluene, is the only known high explosive that combines the merits of safety, reliability and extraordinary power with the requisite capability of large-scale production. Notwithstanding the fact that we have one or two other large sources of toluene, it is unquestionably true that the byproduct coke oven is by far the most important producer. Moreover, it is the one and only source that can be absolutely depended upon to make toluene of the highest purity—especially in respect to freedom from paraffins.

All the facts, when carefully studied, justify the assertion that the byproduct coke industry is one of the most vital to the winning of the war. So essential is this industry to the conduct of modern warfare that the striking power of each nation may, to a great extent, be measured by its supply of the byproducts of coke. The extent of German preparation and advantage in this respect warrants our earnest consideration.

Hard to Obtain Reliable Statistics

It is difficult to obtain trustworthy statistics as to the actual amount of byproduct coke made in the various countries of the world. Fortunately, however, we have very reliable figures[5] for ammonium sulphate. Such figures as have been tabulated for the production of this material from coke ovens may be taken as an index to the extent of byproduct recovery practiced in each country.

In 1907 Germany produced 282,700 tons of ammonium sulphate from byproduct coke ovens. This was more than the production from the same source in all other countries combined. In the same year the United States produced 68,970 tons of ammonium sulphate from byproduct coke ovens. In 1913 the German industry produced 523,114 tons, which exceeded by over 100,000 tons the combined production of the coke ovens of the United States, England, France, Belgium and Holland. The seizure of Belgium and northern France probably gave the Central Powers an advantage in coke-oven resources equivalent to an annual production of 100,000 tons of ammonium sulphate more than the combined production of the Entente Allies plus all the neutral countries of the world. Roughly, this advantage is equivalent to the product of coking 10,000,000 tons of coal. The military significance of these figures is not difficult to realize.

The fact that in the short space of three years great steps have been taken toward equalizing this advantage is an everlasting credit to American enterprise. The year 1917 showed a gain of more than 10,000,000 tons of byproduct coke over the year 1914, which is probably equivalent to an increase of 14,000,000 tons of coal used in byproduct ovens. Ovens now under construction have an additional capacity of over 10,000,000 tons of coal per annum.

Even under the most favorable conditions, however, the American production of byproduct coke in 1918 will be less than the German production at the beginning of the war. The total German production for 1912 was about 32,000,000 and for 1913 about 35,000,000 tons, while the United States produced 22,000,000 tons in 1917 and will probably produce 27,000,000 tons in 1918. When it is recalled that we are still making beehive coke at the rate of 33,000,000 tons per year—nearly as much as the entire German production in 1913—it will be seen that there is still much work to be done.

In fact, it must be admitted that the byproduct oven has so far accomplished little more than taking care of the natural increase of coke production in America. It is a mistake to suppose that we have really done much toward abolishing the beehive oven. The amount of beehive coke made per year has undergone no appreciable diminution since 1906.

These 33,000,000 tons of beehive coke represent the loss of the following products:

Coke	2,475,000 tons
Tar	396,000,000 gal.
Ammonium sulphate	545,000 tons
Surplus gas	300,000,000,000 cu.ft.
Benzene	82,500,000 gal.
Toluene	20,000,000 gal.

Let us consider very briefly what these figures mean. Two and one-half million tons of coke per year, which is based upon the loss in the beehive oven alone and does not take into account the large saving due to superiority of byproduct coke in metallurgical practice, would keep fifteen 450-ton blast furnaces in continuous operation, or would supply the entire foundry business of the United States and leave over three-quarters of a million tons available for domestic purposes.

Four hundred million gallons of tar would, if used for fuel purposes alone, be equivalent to 2,200,000 tons of coal. It would supply enough fuel to produce 10,000,000 tons of open-hearth steel—which would fill the total estimated yearly requirements of the United States and its allies for steel for military purposes.[6]

TABLE I. BITUMINOUS COAL RESERVES OF THE WORLD—CONTINENTS

	Million Tons—Metric
North America	2,239,693
Asia	760,098
Europe	693,162
Oceanica	133,481
Africa	45,123
South America	31,397

BITUMINOUS COAL RESERVES OF THE WORLD—COUNTRIES

	Million Tons, Metric	Equivalent to
United States	1,955,521	Virginia, Tennessee, North Carolina, South Carolina, Georgia, Alabama and Mississippi.
China	607,523	Colorado.
Germany	409,975	Missouri.
Canada	283,661	New York.
Great Britain and Ireland	178,176	Maine.
Australia	132,250	West Virginia.
Russia	86,883	Connecticut, New Jersey and Delaware.
India	76,399	Massachusetts and Connecticut.
South Africa	44,540	New Jersey.
Austria	40,982	New Jersey.
Columbia	27,000	Connecticut.

NOTE—Assuming the above quantities of coal to be distributed in each country in a single solid seam 6 ft. thick, the respective coal bearing area would compare as noted.

TABLE II. BITUMINOUS COAL PRODUCTION OF THE VARIOUS COUNTRIES FOR 1910

	Million Tons		Million Tons
Australia	10.0	Great Britain	264.5
New Zealand	2.23	Spain	3.55
China	14.59	France	38.57
India	12.09	Belgium	23.13
Japan	14.79	Germany	221.98
South Africa	5.5	Austria-Hungary	38.0
Canada	13.01	Italy	0.40
United States	445.81	Sweden	0.21
Mexico	2.45	Russia	24.57
Other countries	8.0 million tons		

[5] Annual reports on sulphate of ammonia prepared by the American Coal Products Co. The original figures in the report for 1914 are given in metric tons, which are here transposed to net tons.

[6] "Iron Age," Jan. 3, 1918, p. 57—estimate for 1918.

Five hundred and forty-five thousand tons of ammonium sulphate are nearly equivalent to the entire annual production of the German Empire just prior to the war. This annual waste of valuable ammonia would furnish about 438,000 tons of nitric acid. A discussion of what this means from a military standpoint is not my purpose, but it would be of interest, in passing, to note that the estimate made previous to the war, by military authorities, for the annual nitric acid requirements of this country in case of war was 180,000 tons.

From the standpoint of food supply this is even a more serious proposition. The permanent loss every year of more than half a million tons of ammonium sulphate—one of the most important nitrogenous fertilizers—might well arouse solicitude at a time when every effort is being made to increase our crop production. By ordinary agricultural practice about 100 lb. of ammonium sulphate are used per acre of cultivated land. We are therefore burning up every year in the beehive ovens enough nitrogen to fertilize 11,000,000 acres. It has been thoroughly demonstrated that the application of 100 lb. of ammonium sulphate to an acre of average wheat land (producing normally, say, 20 bu.) will increase the yield by about 8 bu. Our wasted fertilizer would therefore be capable of increasing our wheat production by 87,000,000 bu. a year without additional labor.

Natural Gas Supply Diminishing

Three hundred billion cubic feet of gas are nearly equivalent to the amount of natural gas consumed for industrial purposes in the states of Pennsylvania, Ohio and West Virginia, which are the three largest consumers of natural gas in the Union. The diminution of the natural gas supply is a matter of grave concern in many important industrial centers, and byproduct coke-oven gas is undoubtedly one of the most promising sources of relief. The same piping and appliances now used for natural gas can with insignificant changes be used for coke-oven gas, and the great benefit that would result from obviating the radical and expensive alterations of equipment otherwise necessary hardly needs to be pointed out. A value of 8c. per thousand cubic feet for the coke-oven gas is a conservative figure from a natural gas standpoint, and would make the loss amount to $24,000,000 a year for this product alone.

Eighty-two million gallons of benzene would be of great value in replacing or supplementing gasoline as a special motor fuel for military purposes, to say nothing of its application to making picric acid, an important high explosive. One hundred gallons of benzene are equivalent, in efficiency, to 115 gallons of gasoline; for any sort of military vehicle of limited fuel-carrying capacity this is an important fact. Eighty-two million gallons of benzene would, if used for such purposes, effect a saving of about 12,000,000 gallons of gasoline. Twenty million gallons of toluene would furnish enough TNT to make 100,000,000 three-inch shells—quite a formidable argument.

Military values are what count nowadays, and one cannot estimate military values in terms of dollars and cents. Yet, for the sake of completeness, we may sum up this situation in terms of very conservative money values under normal conditions (Table III).

It is important to realize that this annual sum total of nearly $100,000,000 worth of the country's natural resources is not merely going unutilized every year, but is absolutely destroyed—gone without the slightest possibility of recovery. It exceeds the value at the ovens of all the coke made in the United States in 1914. In comparison with this gigantic waste, the cost of replacing the antiquated beehive with modern byproduct recovery apparatus sinks into insignificance; even at

TABLE III. MONEY VALUE OF COKE BYPRODUCTS

2,475,000 tons coke at $3.80	$9,405,000
396,000,000 gal. tar at 3½c	13,860,000
545,000 tons ammonium sulphate at $60	32,700,000
300,000,000 M. cu.ft. gas at 8c	24,000,000
102,500,000 gal. motor fuel [7] at 15c	15,375,000
Total	$95,340,000

present prices the replacement could be accomplished for less than $300,000,000. The war is costing the United States about $30,000,000 per day. This rate of expenditure would pay for the abolition of every American beehive oven in ten days.

Perhaps we are departing too far from the scope of what was intended to be a technical paper, but this phase of the subject is one that vitally concerns all of us at the present moment, and every possible agency should be interested and engaged in accelerating the change of the industry to the modern basis. The principal—and probably the only important deterring—factors are the present high cost of material and labor and the difficulty, under present conditions, of financing the expensive plants required. There is a rather strong temptation—which must be thoroughly understood and guarded against—to resort to cheaper forms of construction that have been tried and found wanting in the past, and which, if yielded to, will only discourage and delay the complete establishment of the industry. It would seem that the Government might well assist in furnishing or reinforcing the capital necessary for a wholesale and immediate eradication of the beehive oven. The immediate practical, military benefits would be a sufficient argument, aside from the permanent conservation and the assured stability of the industry. Any development that can increase our wheat crop by

TABLE IV. CONSUMPTION OF COAL AND LIGNITE IN THE UNITED STATES IN 1915

(M. R. Campbell, U. S. Geological Survey, Professional Paper 100-A.)

	Net Tons	Per Cent. of Total
Railroad fuel	122,000,000	28
Steamship fuel	10,700,000	2.3
Beehive coke	42,300,000	9.3
Byproduct coke	19,500,000	4.3
Coal gas	4,600,000	1.0
Domestic and small steam trade	71,300,000	16.0
Industrial steam trade	143,800,000	33.0
Exported	18,800,000	4.0
Used at mines	9,800,000	2.0
Special uses	700,000	0.1
Total	443,500,000	100.0

nearly 90,000,000 bu. per year, that can more than double our material for high explosives, that is absolutely necessary in order to insure to America and its allies an unquestioned superiority in modern munitions, should be encouraged and hastened with every possible facility.

Nor must it be forgotten that the beehive is not the only spendthrift of the important byproducts of coal. The householder who burns a hundred tons of Pittsburgh coal in the winter months is likely, while standing aghast at the "crime of the beehive oven," to forget that he himself is accessory in what is in the aggregate a greater crime. Table IV, compiled from the sta-

[7] Including only benzene and toluene. If all the available light oil constituents were included we would have at least 120,000,000 gal. motor fuel.

tistics of the United States Geological Survey for the year 1915, shows the distribution of the coal produced in the United States.

Every encouragement should be given to the use of coke, gas, and briquetted fuel, which not only are important in national conservation, but are intrinsically cleaner, more economical and more convenient.

All such considerations, vital as they may seem to the needs of the present moment, are in a larger sense dwarfed by the significance of America's enormous preponderance in reserves of coking coals. These are such as to insure the stability and normal growth of the industry for many centuries in a sense that is true for no other country. The statistics given in Table I were taken from the elaborate report of the Twelfth International Geological Congress on the Coal Resources of the World.

The figures for bituminous coal may be taken as a comparative index of the reserves available for making coke. It is the byproduct oven that makes this broad generalization possible. Consider, with these statistics, the supplementary figures in Table V for the principal iron reserves of the world, compiled by Edwin C. Eckel.[8]

TABLE V. PRINCIPAL IRON ORE RESERVES OF THE WORLD

United States	Minimum	Maximum
Lake Superior region	2,000,000,000	2,500,000,000
Southern red ores	1,500,000,000	2,000,000,000
Texas brown ores	600,000,000	1,000,000,000
Other Southern ores	500,000,000	750,000,000
Northeastern States	300,000,000	600,000,000
Western States	300,000,000	700,000,000
Total United States	5,200,000,000	7,550,000,000

Continent	Actual Ore Tonnage	Equivalent Tons Metallic Ore
North America	14,710,000,000	6,455,000,000
South America	8,000,000,000	5,000,000,000
Europe	12,032,000,000	4,733,000,000
Total	34,742,000,000	16,188,000,000

It needs no prophetic imagination to foresee that the future of the vast industries that are based on these two materials must largely rest with America, and her duty to conserve such resources becomes more than a local necessity; it is an international obligation.

It may be of interest to survey the present distribution of the byproduct coke industry in America, and the way in which the various coal fields are being utilized.

Byproduct coke is now being made in the following states: Massachusetts, New York, New Jersey, Pennsylvania, Maryland, West Virginia, Alabama, Kentucky, Michigan, Indiana, Illinois, Wisconsin, Missouri, Minnesota, Tennessee and Washington. Plants are also being built by The Koppers Co. in Colorado and Rhode Island —eighteen states in all. Of these, only six—Alabama, Colorado, Ohio, Pennsylvania, Tennessee and West Virginia—were coke producers of magnitude before the advent of the byproduct oven. Together with this tendency to distribution, there is also an effort of concentration which is important. The effect in transplanting the business of coke manufacture from more or less secluded mining districts to important industrial centers is very marked. Two-thirds of the byproduct coke producing capacity of the United States (including ovens under construction) is located within two hours' ride of one or another of five large cities: Chicago, Pittsburgh, Cleveland, Detroit and Birmingham. The amount of byproduct coke capacity in these five metropolitan districts exceeds the total coke (beehive and byproduct) made in the United States in 1900.

[8] "Iron Trade Review," Jan. 15, 1914.

The intensive concentration of plant capacity made possible by the byproduct coke oven is especially noteworthy. A striking example is the plant being built by The Koppers Co. for the Carnegie Steel Co. at Clairton, Penn. This plant, the largest in the world, will soon be put into operation with 640 ovens, having a capacity of 4,000,000 tons of coal per year. The plans provide for an extension of this plant to a total of 24 batteries of 64 ovens each. Some data as to the capacity and production of such a plant are as follows:

ANNUAL CAPACITY OF 1,536 OVENS

Coal	9,600,000 tons
Coke	6,720,000 tons
Tar	80,640,000 gal.
Ammonium sulphate	110,880 tons
Surplus gas	60,480,000,000 cu.ft.
Benzene	16,800,000 gal.
Toluene	4,032,000 gal.

This great plant, when completed, will have a coking capacity equivalent to 11,200 beehive ovens (one 12-ft. beehive oven producing 600 tons of coke per year). In ordinary double-row construction (120 beehive ovens to a block 900 ft. long) this would make 16 miles of beehive ovens. The byproduct plant, including some vacant space, is only 1500 yd. long and 1200 yd. wide.

(*To be continued*)

Purification of Coal Gas by Electricity

BY M. MEREDITH
Liverpool, England

The deposition of tar and other impurities from coal gas by electrical means has recently been undertaken and satisfactory results have been attained. High-tension direct current is discharged between a cage made of thin wires and a tube, the system of wires being mounted in the middle of the tube. It is essential to prevent access of air to the precipitation chamber in order to avoid the danger of explosion. It was found that the tendency toward the production of harmful discharges is least if the wire electrode is negative. The shape of the electrode is highly important, and the sustaining insulators are specially formed and cemented into the tube. A ½-in. gas tube is passed through a series of cast-iron disks, between which the thin steel wires are fixed. The whole is then placed in a felt-covered tube, which constitutes the grounded electrode.

The apparatus was tested with a flow of 265,000 cu.ft. of gas per hour, two precipitation chambers 4 ft. 11 in. in height and 8 in. in diameter being used. Disks of the active electrode were 4 in. in diameter, and were covered with 16 thin piano-steel wires. The passage traversed by the gas was 12 ft. 4 in. long. The gas was exposed to the electrical discharge for 0.4 second.

After five hours' operation the tar deposited on the insulators was found to interfere with the action. For complete cleansing of the gas 0.2 kw.-hr. was required for each 265,000 cu.ft. The total cost of the apparatus was about $500. The test was made with 20,000 volts and a current of about 3 milliamperes.

The temperature of the coal gas has little influence on the operation. Tar deposited at 175 deg. F. is free from water and suitable for asphalting. It can be cleansed in a washing apparatus and the residue of naphthalene can be reclaimed by a second electric precipitation. The illuminating and heating capacity of the gas is improved if the tar is removed while hot.

Dewatering Pits for Washed Coal

THE Cambria Steel Co., of Johnstown, Penn., after much investigation of washed coal dewatering devices and methods, and 14 years of experience with dewatering pits at its Franklin washery and coke-oven plant, has adopted dewatering pits for washed coal at the Rosedale washery and coke-oven plant now under construction. The succeeding description of dewatering pits elucidates the most important features that should govern adoption.

The attractive features of dewatering pits are: (1) A drained washed coal containing 8 to 9 per cent. moisture; (2) a filtered water free from sediment, for recirculation; (3) no escape of dirty water (to pollute private and public streams) except that small amount evaporating and adhering as external moisture to the coal; (4) a rapid filtration of the water so as to gain a brimful pit of coal, without shifting the stream of water and coal from the washing machines; (5) uniformity of the drained mass of coal, in regard to fine and coarse sizes, sludge and pieces of various characteristics being evenly distributed so that a homogeneous coking coal may be gathered; (6) no mechanical power necessary to aid or hasten the dewatering of the coal; (7) permanent construction with only a minimum maintenance expense; (8) an economically operated apparatus for removing the drained coal.

The principle involved in the drainage of a pit of coal is that water moves gradually in a wavering descending motion through a mass of minute particles at rest, and is clarified during this movement. The dewatering capacity of a pit depends upon the relation between the number of square feet of filtering surface to the quantity of water delivered in a given time and the fineness of the coal.

Tests Indicate Average Filtering Capacity

Tests made at five coal washeries using dewatering pits indicate that the average filtering capacity of a pit is 32 gal. of water per hour for each square foot of filtering surface, when dewatering coal in sizes ranging from ½-in. cubes to dust, and the pit will be filled brimful of coal without temporary cessation to prevent water overflowing the pit walls. Most careful moisture determinations were also made of the drained washed coal at different times as gathered from the pits for coking after various hours of drainage, with the results shown below, the drained washed coal averaging in fineness ½-in. cubes to dust. (See Fig. 1.)

Pits 24 Ft. Deep	Average Moisture, %	Maximum Moisture, %	Minimum Moisture, %
After 24 hours' drainage	9.15	10.36	7.37
After 36 hours' drainage	9.05	10.61	7.10
After 48 hours' drainage	8.26	10.13	7.00
After 60 hours' drainage	8.05	9.74	6.84
After 72 hours' drainage	7.97	9.48	6.18

Pits 16 Ft. Deep	Average Moisture, %	Maximum Moisture, %	Minimum Moisture, %
After 12 hours' drainage	10.05	12.96	8.16
After 24 hours' drainage	8.46	9.07	8.06
After 36 hours' drainage	8.39	8.60	8.03
After 48 hours' drainage	7.90	8.31	7.76
After 60 hours' drainage	7.65	8.00	6.85
After 72 hours' drainage	7.60	7.79	6.90

The pits are formed by rectangular concrete walls of a thickness suitable to withstand the pressure when the pits are filled with coal and water. The ultimate concrete bottom is laid slightly sloping toward centrally located drains which transfer the filtered water to a pump sump for repeated use. Above the ultimate bottom, leaving an intervening space of 4 in., a filtering platform is placed. This contains small V-shaped gaps for supporting the coal and allowing the passage of the dripping filtered water onto the concrete bottom. In practice the final 8 to 12 in. in depth of coal is not drawn off but remains on the filtering platform as a permanent filter bed. This bed should be stirred up frequently, say after each third filling of the pit, by the appliance provided on the traveling coal excavator, so as to present a more nearly perfect porous bed, in order that the filtering capacity of the pit may not become diminished.

The permanency of properly designed and constructed concrete pits is unquestioned. They do not deteriorate in usefulness or value by constant usage. The only renewal necessary is the replacement of the false bottom used as a filtering platform in two to four years, according to usage. This platform is built in sections of about 4 x 6 ft., so that one or more sections may be readily replaced when necessary.

Cleaned Coal Delivered by Sluiceways

The cleaned coal and black water from the washing machines is delivered directly to the pits by means of extension gravity sluiceways swung over the top of the pit so that the latter will be uniformly filled with coal. The separation of the water from the coal requires no machinery, attendance or supplies. To save the water draining from pits when the washing machines are not in operation, concrete reservoirs of sufficient capacity are provided with drains from the pits and to a pump sump, so that all water will be saved for recirculation when the washing machines are again operated. As there are no drains leading from any part of the drainage system to sewers or ditches, there is no chance to pollute streams with water holding impurities in solution or suspension.

There are no mechanical dewatering units between the washing machines and the drainage pits. The problem of sludge and dirty water disposal is thus entirely eliminated, as all fine coal and sludge is intermixed with the drained washed coal. This method of dewatering results in a great saving of water, power, labor and upkeep over the ordinary expensive dewatering methods employing centrifugal driers or perforated bucket elevators, with sludge tanks and a multiplicity of machinery. Wherever these are in use great fields of fine coal and sludge are visible with the accompanying pollution of near-by streams.

The fines to be dealt with consist of particles capable of passing through extremely fine meshes, the greater part of them being from ⅛ in. to 1/100 in. in diameter, or say, from 64 to 10,000 to the square inch.

By an act passed by the Pennsylvania Legislature in 1907, the Water Supply Commission of the state was given jurisdiction over encroachments along the streams and the dumping of solid wastes into them. This measure provides a heavy penalty and covers all streams whose

drainage areas are over ½ square mile in extent, except the tidal portion of the Delaware River and its navigable tributaries. Ultimately this law will be universally and thoroughly enforced. In Table I is shown the number of square feet of pit filtering surface necessary, when washing coal at the rate of 200 net tons per hour, with washing machines that require varying quantities of water in order to wash one net ton of raw crushed coal.

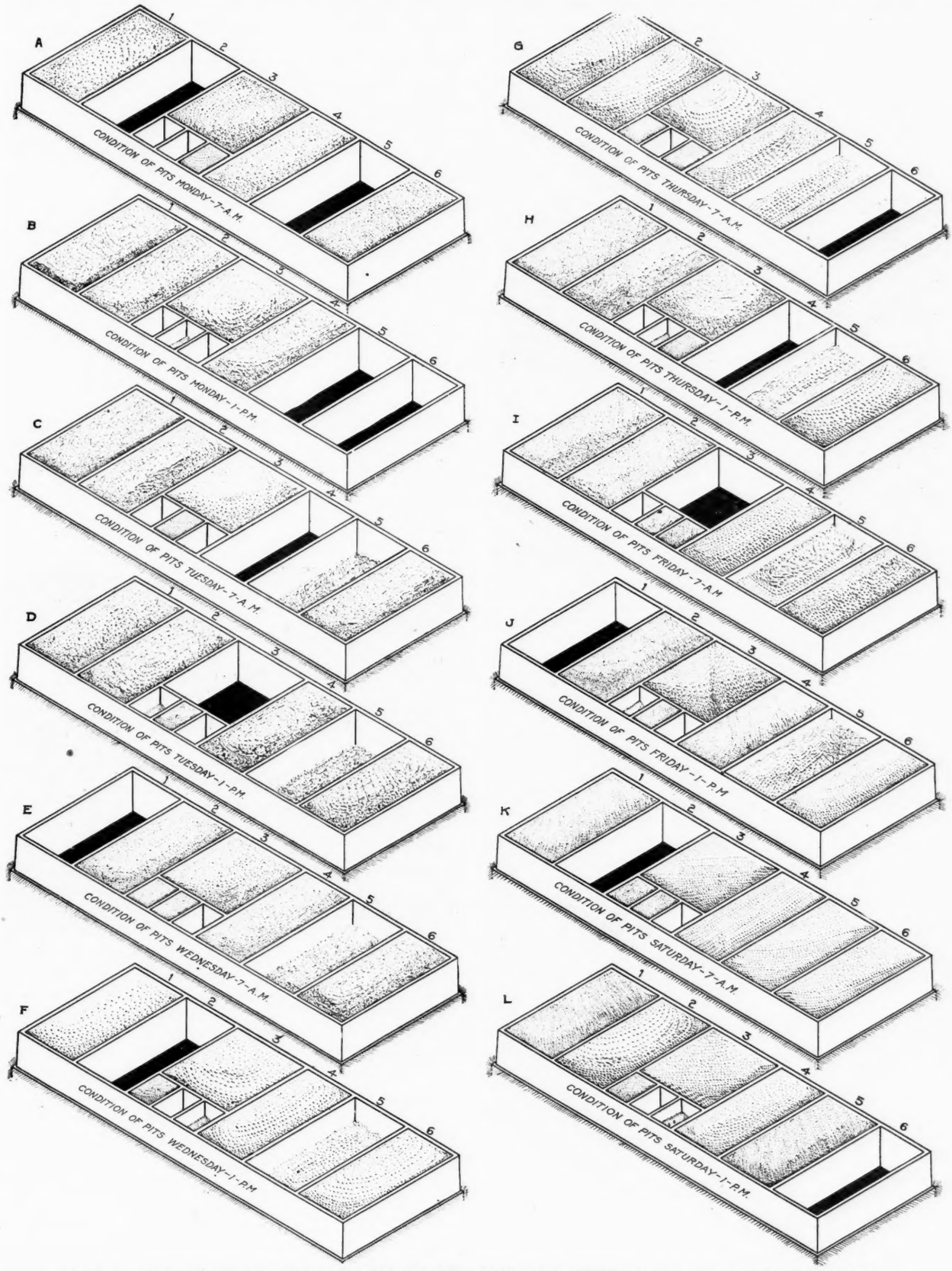


FIG. 1. ILLUSTRATING CONDITION OF WASHED COAL AND REFUSE PITS AT STATED INTERVALS

TABLE I. MOISTURE DETERMINATIONS AFTER VARIOUS HOURS OF DRAINAGE

Ratio of Water to 1 Ton of Coal	Various Quantities of Water Necessary to Wash 1 Net Ton of Crushed Raw Coal In Cu.Ft.	In Gal.	In Lb.	Net Tons of Crushed Raw Coal Washed per Hour	Square Feet of Pit Filtering Surface Necessary
1	32	240	2,000	200	1,500
1½	48	360	3,000	200	2,250
2	64	480	4,000	200	3,000
2½	80	600	5,000	200	3 750
3	96	720	6,000	200	4,500
3½	112	840	7,000	200	5,250

The ratio of water to that of coal is determined by the water requirements of the particular coal-washing machine under consideration. One washery handling 200 tons of coal per hour, adopting a specific form of

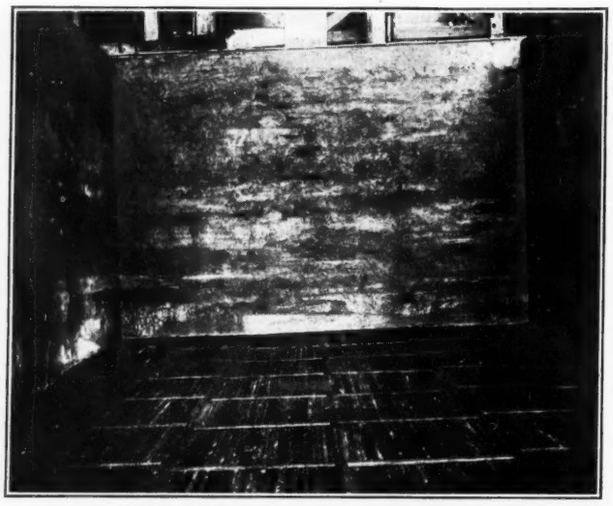


FIG. 2. DEWATERING PIT AT COAL WASHERY OF CASCADE COAL AND COKE CO., TYLER, PENN.

washing machine, may need water in the proportion of 1½ to 1 of coal, requiring only 2250 sq.ft. of pit filtering surface; while another washery handling the same tonnage per hour using another form of washing machine may need water in the proportion of 3 to 1 of coal, necessitating 4500 sq.ft. of pit filtering surface.

When considering the adoption of dewatering pits, it is important to study the water requirements of coal-washing machines and to see that a machine requiring an extravagant quantity of water is not selected, since it would demand dewatering pits of extreme and excessive dimensions. As aforementioned, the series of tests made, relating to the filtering capacity of pits, demonstrated that the drainage capacity averaged 32 gal. of filtered water discharged per hour for each square foot of filtering surface, through coal ranging from ½-in. cubes to dust.

To ascertain the floor dimensions of a pit to hold, say, 1000 net tons of drained coal, or 40,000 cu.ft., weighing on a dry basis 50 lb. per cubic foot, assuming that water will enter the pit with the coal for five consecutive hours, the coal coming at the rate of 200 tons an hour, each ton requiring 360 gal. of water for washing, the water filtering away at the rate of 32 gal. per hour for each square foot of filtering surface, the formula is as follows:

Let

a = The number of gallons of water required to wash one ton of coal;

b = Tons of coal delivered to pit per hour;

c = Gallons of water filtering away per hour, per square foot of pit surface;

x = Square feet of pit surface required.

Then $a \times b = x$.

Example—a = 360 gal. of water per ton of coal;

b = 200 tons of coal;

c = 32 gal. of water per hour per square foot of draining surface.

Then $360 \times 200 \div 32 = x$, or 2250 sq.ft. of pit floor surface required. This would be equivalent to a pit, say, 30 ft. wide by 75 ft. long.

The formula for determining the height of pit walls is as follows:

Let

d = Square feet of pit surface required;

e = Cubic feet of coal required;

x = Height of walls in feet;

$e = x$.

Example—d = 2250 sq.ft. of pit floor surface;

e = 40,000 cu.ft. of coal.

$40{,}000 \div 2250 = x$, or 17 ft. 10 in. = the height of pit walls.

To offset the 8 in. to 12 in. in depth of coal used as a filter bed and the height of filter platform above the concrete floor, about 20 in. must be added to the height of walls, to acquire a working capacity of 1000 tons of coal. This will make a pit averaging, say, 30 ft. wide, 75 ft. long and 19 ft. high above the concrete floor.

A pit to drain coal from a washery using 720 gal. or double the quantity of water assumed above as being

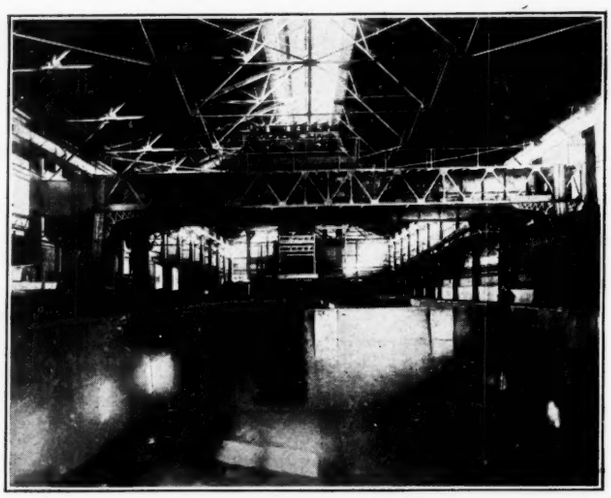


FIG. 3. DEWATERING PIT AT NO. 3 COLLIERY WASHERY, LACKAWANNA COAL AND COKE CO.

necessary to wash a ton of coal, would require a filtering surface of 4500 sq.ft. to receive the coal and water in five consecutive hours at the rate of 200 tons of coal per hour. This would mean a pit, say, 45 ft. wide, 100 ft. long and with a total depth of 10 feet 6 inches.

A pit this size would not be economical in ground space, construction or in handling the coal and water to and from it. Dewatering pits are not practical to operate in connection with washeries using an excessive quantity of water to wash a ton of coal.

The table showing moisture determinations after various hours of drainage indicates that after 24 hours in disturbance, additional drainage time does not reduce

the moisture content of the coal materially, the water draining off rapidly; and with the exception of a few feet at the top, no benefits of air circulation are secured to aid in reducing the moisture. The coal is so closely packed by the water action that trenches formed by slides 30 in. wide and 4 to 6 ft. deep do not cave in.

The drained coal is gathered from the pits by a crane, having a vertical and horizontal motion. This is mounted on wheels and provided with numerous buckets for excavating and elevating the coal to a belt conveying system that discharges it into larry bins for use in coking. The crane spans the pits, and its movements are guided by rails fastened to the top of the longitudinal pit walls. The elevating capacity is from 400 tons per hour up.

Referring to the illustrations, Fig. 1 indicates the condition of the washed coal and refuse pits over a six-day period. Fig. 2, which illustrates a dewatering pit at the coal washery at Tyler mine of the Cascade Coal and Coke Co., gives a good view of the filtering platform. Each pit is 30 ft. wide, 30 ft. long, 16 ft. deep, and holds 360 net tons of coal. Fig. 3, a view of the dewatering pits at the No. 3 colliery coal washery of the Lackawanna Coal and Coke Co., near Wehrum, Penn., indicates the relation betwen the dewatering pits and the crane used to reclaim the coal after drainage. Each pit is 70 ft. wide, 35 ft. long, 24 ft. deep, and holds 1500 net tons of coal. The filtering platform has been removed so as to show the concrete bottom and the drains which convey the filtered water to the pump sump for reuse.

Who's Who In Coal Mining

W. E. Deegans

Pep, punch and perseverance (not to speak of his red hair) are characteristics which have given W. E. Deegans, of Huntington, affectionately known to his friends as "Bill," his conspicuous place in the coal industry of southern West Virginia. There are few counties in that part of the state that do not have one or more companies in operation in which W. E. Deegans is interested. "Bill" Deegans has personality and magnetism, like all big and genial men. That pleasing personality, with his keen business acumen and well-balanced foresight, has enabled him to forge rapidly to the front in West Virginia's industrial life. Old man Opportunity has never managed to elude the vigilance of W. E. Deegans. When Opportunity appeared on the scene, the door was opened even before Opportunity knocked.

Only two-score years have passed since a red-headed youngster arrived with a smile in a Coal Grove, Ohio, household. When young Deegans was not attending the Lawrence County schools he was working in his father's mines. In that way he gained a pretty thorough knowledge of mining, knowledge which stood him in good stead in after years, when he began to acquire and operate coal properties.

Thurmond, in the heart of what is now the New River coal field, attracted W. E. Deegans to West Virginia before he was of age. When he was following other lines of business he ever kept one eye on the possibilities of West Virginia as a great coal-producing state, and all his surplus, when he had one, went into coal lands or was invested in coal stock. His judgment was, before long, vindicated, and in the course of a few years he found it necessary to devote his entire time to his coal properties, which have now become so numerous that they are located upon two different roads in widely scattered sections. He directs the affairs in sixteen different mining operations, some of which are: The Beckley Vein Coal Co., Cub Fork Coal Co., Deegans Eagle Coal Co., Devils Fork Coal Co., Guyan Valley Coal Co., Miller-Pocahontas Coal Co., Mullens Smokeless Coal Co., Orville Coal Co., Paragon Colliery Co., Royal

W. E. DEEGANS

Block Coal Co., Sterling Colliery Co. and the Virginian Smokeless Fuel Company.

The center of Mr. Deegans' activities are at Huntington, from which point he directs operations so far as it can be done from the office. Huntington was no doubt chosen because the Virginian, Chesapeake & Ohio and Norfolk & Western railways converge at that point, and with as many mines as he has to direct, he must have a convenient place from which to jump in any direction. It would keep any man constantly on the go, but as Bill Deegans is a veritable human dynamo, he thrives on work that would wear out any ordinary individual.

With all he has to absorb his attention, Bill Deegans nevertheless has time for his friends, and time to smile and shed happiness all around him. Busy as he is with his own affairs, he has yet found time, or made it, to engage in many war-work activities and to help in every public movement.

On the basis of four tons of bituminous coal said to be necessary on the average to produce one ton of steel products, the increased output of steel in 1916 would indicate an increased demand of 40 million tons of bituminous coal in 1916 for the steel industry.

Development Period of a Mine

By H. H. STOEK
University of Illinois, Urbana, Ill.

SYNOPSIS—*When does the operation of a mine begin? Six answers to this question are here given, and the advantages and disadvantages of each set forth. A wide diversity in opinion and practice exists, and discussion is invited.*

IN a recent article in the *Daily Digest* of the National Coal Association, W. B. Reed, accounting secretary of the association, says:

In the development of a coal mine all expenditures should be capitalized, and this course should be followed until the projected capacity of the mine is reached, the operating buildings constructed, the machinery installed, and the mine is producing, or is in a position to produce, the quantity of coal for which it was developed. During this period credit should be given to the development for the development product; that is, for the coal produced during that period.

After this point is reached and the mine settles down to a normal production, the purpose of each additional expenditure for equipment will need to be carefully weighed as to whether or not it is properly an item of expense or an additional investment of capital, a replacement of a unit worn out and demolished, or an additional unit of the same kind intended to increase production, and whether it will permanently and materially increase the output, or decrease costs; also whether it will have a salvage value because of the fact that it may be sold or transferred to another operation, when the operation for which it was purchased has been abandoned.

This, at first sight, seems very reasonable, but it by no means represents the practice of many mining companies at the present time and it may, therefore, be of interest to consider some of the methods used for determining when development charges end and when operating charges begin.

Operation Charge Should Begin Early

Accountants and writers on costkeeping generally advise that the charge for operation should begin as early as possible in the life of the operation so as not to have an unduly overloaded capital account and so that operating costs may be watched closely as soon as possible. Quite naturally the operating man tries to put into capital and overhead accounts everything possible so that his daily costs may be kept down, and he is in sympathy with anything that will apportion charges to any other account than operation and is willing to have the development charge kept open as long as possible.

To obtain uniform costs, or costs that permit a comparison to be made between different companies or different mines operating under the same company, it is not of nearly so much importance at just what point development costs cease and operating costs begin, but it is highly important for purposes of comparison that all of the companies or all of the mines should adopt the same point.

I know of the following different practices in this matter, and the advantages and disadvantages of each as I see them are given under each head noted.

1.—*Operation begins when the shaft penetrates the coal.* This is the practice of the superintendent of one division of a large coal company, but it is quite unusual and the reason for its adoption seems to have been purely a local convenience in bookkeeping in order to keep the shaft-sinking costs entirely separate from the underground operations and so that these could be definitely closed as soon as the coal was penetrated. After that time all work of opening up was kept as a distinct item and charged to operation. Whatever may be the justification in this particular instance on account of local conditions, it is not a practice that will be generally used, as it separates from the operating account a considerable expenditure that properly belongs there.

When Does Operation Really Begin?

2.—*Operation begins when the mine has reached the full daily output for which it was designed.* This is the time given by W. B. Reed in the *Daily Digest* of the National Coal Association, and while it is apparently a perfectly logical point to adopt there are arguments against it that need to be considered and are of importance. Many mines do not reach their rated capacity for many years, if ever, due to market or other conditions. Suppose, for instance, a mine is designed for an output of 5000 tons per day and all of the surface equipment needed for such an output is provided, but due to unforeseen troubles in operating, labor conditions, inadequate market, etc., it is found impossible to raise more than 4000 tons of coal per day. Such a mine under definition 2 would never be an operating unit, although it might be a regular producer of a large amount of coal and be worked at a profit.

The principle of this method is used by many companies by charging to capital account or some account such as "construction" all development charges until the mine is ready to produce the daily tonnage for which it was planned; that is, until enough entries have been driven and provision made for sufficient rooms to give the desired output if labor and trade conditions warrant it. Up to this time all the development, plant and equipment costs are charged against capital account, while all coal sold during that time is credited to that account. After the mine has been developed to the point where it can produce its rated capacity, the operating charges are begun and thereafter all expenditures are so charged unless they are intended to give a positive increase in capacity over the original plan, in which case they then become capital charges.

J. R. Findlay, in his book on "Cost of Mining," charges to capital all expenditures up to the time when the mine is producing and after that time only such expenditures are capital charges as are made to increase the capacity of the mine. This continues until the time when the mine has reached what appears to be an average production. The capital thus charged is the amount to be amortized over a reasonable period at a given interest rate. For this purpose Findlay uses a rate of 5 per cent.

3.—*Operation begins when coal is hoisted from rooms.* This method is used by a number of companies and gives a very definite point and one that marks the time when the mine is really a producing one and not merely a mine under development. It has the advantage of giving a definite point that insures uniformity among a number of mines and it is not dependent on trade, market or labor conditions.

An objection to this point is that the mine may not be self-supporting or making money for some time after this point is reached, and it is not working under normal conditions until it can be said to be self-supporting. Also during the unprofitable construction and the development period it is generally considered allowable and wise to charge interest upon the capital invested and to include this as a part of the total capital that has to be amortized. If the break between capital and operating charges is made before the mine can operate at a profit, or at least without a deficit, the interest-bearing period upon capital is shortened unduly or else there is introduced an increased difficulty in accounting.

DEFINES THE TERM "EVEN BREAK"

4.—*Operation begins when an "even break" occurs.* The term "even break" as used by a number of companies in determining this point means such a time in the operation of the mine that the selling price just equals the operating cost and there is neither profit nor loss on the operation. Such a point is, of course, indefinite and depends upon trade conditions, markets, contracts, weather and many other variables, so that it is difficult or impossible to compare conditions between a number of different companies; in other words, to adopt a common standard. Such variables will, of course, be most serious in mines operating under widely different conditions or in different localities, while for a group of mines in the same district with approximately the same equipment and operating under the same labor conditions, the difficulty of reaching a point for each mine that would be comparable for other mines is not so great.

5.—*Operation begins when the output has reached a certain percentage of the rated output of the mine.* This method is quite widely used and the percentage so far as I know varies from 50 to 66⅔ per cent. of the output. This gives a fairly definite starting point and one that is likely to be reached within a reasonable time, even though the full rated capacity may not be expected for an indefinite time in the future. It is also a point not influenced nearly so much as is the rated capacity point by market, labor and like trade conditions. The relation between this method and method No. 4—that is, the even break period or the time when the mine begins to make money—varies widely with local working conditions and depends, of course, upon the amount of invested capital, trade and labor conditions, etc.

To show the wide divergence in practice in this matter, at a number of mines that I have examined, operation accounts have been started when the mines have reached 30, 33⅓, 50, 55 and 60 per cent. respectively of their rated capacities or of the capacity subsequently obtained under full operating conditions, because rated capacity is also a somewhat indefinite point and many mines are worked to an overload and even though rated for 5000 tons, they may produce 6000 tons or more.

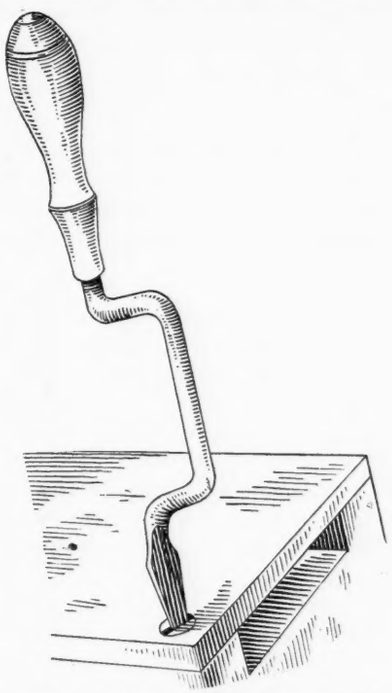
6.—*Operation begins when a certain arbitrary output per day has been reached or when the mine is prepared to produce such an arbitrary output.* In a number of cases with which I am familiar 1000 tons output has been assumed, and when this point has been reached the accounts have been changed from capital to operation, no attention being paid to the rated production capacity or whether the mine was making money or not.

This method may be fairly satisfactory where mines of approximately the same size are compared, but is not a satisfactory comparative method for mines of widely differing daily or yearly capacities.

Undoubtedly there are a number of other methods used by mining companies for separating capital from operating accounts, and I would be glad indeed to know of such and to see the reasons for their adoption stated as well as the advantages claimed for them set forth in the columns of *Coal Age*. I would also be glad to have a discussion of the methods outlined above, for although some of them may seem to be rather academic, all are at the present time being used and apparently giving satisfaction to the companies employing them.

A Crank Screwdriver

The driving home of large machine or wood screws is quite a tedious job if an ordinary screwdriver is employed. The improved screwdriver shown in the accompanying illustration will overcome any unnecessary



NOVEL FORM OF SCREWDRIVER

expenditure of energy and avoid injury to the hands, which often resuits if an ordinary screwdriver has to be used for any considerable length of time.

In operating the device illustrated, pressure is applied as usual, while the rotation of the screw, regardless of resistance, is made easy through the aid of the crank, which affords a much better leverage than the up-and-down form of screwdriver in everyday use.

Routine Determination of Specific Gravity of Coal

By ABRAHAM G. BLAKELEY
Pottsville, Penn.

SYNOPSIS — *The specific gravity of coal may be employed as a standard, more or less accurate, by which its fuel value and ash content may be judged. Difficulty may be experienced in manipulating coal crushed finer than "4-mesh," as the smaller particles tend to float in water. In such a case kerosene may be advantageously employed as the immersion medium.*

THE determination of the specific gravity of coal is of value for several reasons. The results are often utilized in calculating the quantity of coal in a given area underground. They possess utility in figuring the weights of different coals in cars or wagons, while in some cases they may help to decide whether coal came from some particular bed or from some certain mine or region. Specific gravity is a factor to be considered in the separation of coal from slate or bone or from cinder. This latter separation is of serious importance to operations recovering coal from streams.

Moreover, specific gravity results, if rightly interpreted, may be used as a rapid means of roughly judging the quality of coal from any particular mine. The specific gravity bears quite a definite relation to the ash content of coal. From any specified mine, coal samples of approximately the same ash content will have approximately the same specific gravity. Slate is heavier, or higher in specific gravity, than coal. Bone is intermediate between coal and slate in its ash content and in its specific gravity.

Ash Content and Specific Gravity

For anthracite coal, an increase of 1 per cent. in ash content will correspond to an increase in specific gravity of approximately 0.01. If a coal from a certain mine shows a specific gravity of 1.61, corresponding to 13 per cent. ash content, and a second sample from the same mine shows a specific gravity of 1.80, it may safely be assumed that the second sample will have an ash content approximately 32 per cent. Averages of hundreds of results on many different coals form the foundation on which this statement is based. Specific gravity can therefore be used as a quick means of judging the quality of a coal. Specific gravity results are not of equal utility to the consumer unless he knows from what mine or region the coal came.

Recently a sample of boiler fuel from a colliery boiler plant came in for test. There had been some complaint as to quality of the coal. The sample, after receipt at the chemical laboratory, was ground to about 10 mesh size, and a determination of specific gravity made. This was found to be 1.85 to 1.87, with an average of 1.86. Other samples of coal from this colliery had shown average results as follows:

Size of Coal	No. of Samples	Specific Gravity	Ash (Dry Basis)
Chestnut...	29	1.61	12.89
Pea.....	30	1.65	15.75
Buckwheat	30	1.67	18.20
Rice.....	29	1.75	26.24
Total and Average	118	1.67	18.27

From these results the ash corresponding to a specific gravity of 1.86 was calculated as 37.27 per cent., or approximately 37 per cent. ash.

In the meantime the boiler fuel sample was being finely ground (60 mesh or finer) for complete analysis. The ash was determined and figured to a dry coal basis. The result was 35.86 per cent., or approximately 37 per cent. ash.

Thus the specific gravity determination afforded a rough means of estimating the quality of this boiler fuel. The agreement as shown in this case, less than 1 per cent., will not always be so close. Nevertheless the specific gravity determination is certainly not without some value.

In 1909, together with my assistant at that time, Edwin M. Chance, I published a paper entitled "A Rapid Method for Determination of Specific Gravity of Coal." This method, as published in *Journal of Industrial and Engineering Chemistry*, December, 1909, is given below:

During the routine work of this laboratory it is necessary to determine specific gravity on a large number of samples of anthracite coal. As the methods available gave but little satisfaction commensurate with the time and labor entailed, we had recourse, after considerable experimentation, to the herein described procedure.

The apparatus, first of all, is simple, and may be found in almost any laboratory. The first requirement is a stout flask of about 250 cc. capacity, with a long and rather slender neck, terminating in a flaring mouth, such as the "copper determination" flask supplied by the Denver Fire Clay Co. This flask is to be marked at the base of the neck, either by a file scratch or by etching, and its volume up to this mark determined by means of a 100 cc. automatic pipette and a 100 cc. burette, graduated in 0.2 cc.

The burette should have a three-way stopcock and be connected with a reservoir either below or above the level of its top. In the former case suction is used to fill the burette, while in the latter case gravity is the means. It is better to use the elevated reservoir and gravity feed for the pipette. Of course, it is understood that a plain burette and pipette can be used, the form described merely having the advantage of rapidity.

The flask is calibrated as follows: The flask is rinsed with water, inverted, and allowed to drain for one minute; 100 cc. water is then added from the pipette, the flask is then filled to the mark from the burette. In calibrating by this method, inaccuracies in either pipette or burette do not militate against the accuracy of the specific gravity result, as the same method is pursued in the final determination.

The actual determination is carried out as follows; 100 grams of coal, previously crushed to about 4 mesh, and carefully sampled, are weighed to 0.1 gram, and placed in the flask. 100 cc. of water is run in, a 1-hole stopper fitted with bent glass tube and rubber connection is inserted in the mouth of the flask; suction is applied, and the flask is shaken, care being taken that no water is splashed into the glass tube. When air bubbles cease to be disengaged, the suction is interrupted and the stopper withdrawn. Water

is now run in from the burette till the flask is filled to the mark, care being taken to work down any coal which may have stuck in the neck.

The results may be calculated as follows:

$$\text{Specific Gravity} = \frac{100}{V_0 - V_1}$$

wherein V_0 = volume of the flask; V_1 = number of cc. water added to coal.

No calculation at all need be made if a table of reciprocals be available, as specific gravity = 100 × reciprocal of $V_0 - V_1$. As an example 100 grams coal were taken; volume of flask, V_1 = 262 cc.; volume of water added to coal, V_1 = 197 cc.

$$\text{Specific Gravity} = \frac{100}{262 - 197} = 100 \times \frac{1}{65} = 1.54$$

After making a determination the flask is emptied and rinsed, then allowed to drain for one minute, when another determination may be made.

This method is very rapid and so simple that an inexperienced operator can without difficulty make over 80 determinations per day accurate to within 0.02 unit of specific gravity. It is, of course, self-evident that this method has a wide range of applicability; the gravities of such materials as rocks, drillings, etc., may be determined with ease.

While the authors claim nothing new or radical in this process, still they submit it as a procedure by which results of moderate accuracy can be obtained with great rapidity, while the outlay for special apparatus is practically nil.

This method has been used since the date of publication and has given fairly satisfactory results. However, I have often had occasion to determine the specific gravity on samples of coal much finer than "4-mesh" size, and have in the case of coal samples of 10-mesh size or finer experienced some difficulty in obtaining reliable results. The fine coal has a great tendency to float on the surface of the water, thus obscuring the water level and making it almost impossible to judge the proper meniscus.

By a simple and inexpensive modification of the foregoing method thoroughly reliable results may be obtained on finely crushed coal. In place of water for the calibration and for the determination, ordinary kerosene or 150 deg. oil is used. The fine coal sinks readily in the oil and does not tend to obscure the meniscus. The oil after use is poured into a stock bottle or waste oil bottle and can be purified later when sufficient oil has been accumulated. Filtration through dry filter paper will remove both coal dirt and water.

After the oil is poured from the specific gravity flask, the flask is rinsed out by means of water, inverted, and drained as described previously. The little water left in the flask has no appreciable effect upon the accuracy of the results. The extra time taken in pouring the dirty oil into the stock bottle is more than offset by the time and trouble saved in reading of the meniscus and in general accuracy of results. Determinations can be duplicated readily to 0.02 unit of specific gravity.

In conclusion, I claim nothing particularly new in this method, but submit the procedure as a help to others working in similar fields of endeavor.

Coal is by far the most important of all the mineral products of the United States. Next to coal in importance is iron. Little Belgium, because of its important coal and iron deposits, has been a hive of industry, occupying a position as a manufacturing nation far beyond what one would expect from its limited area and population.—*Van Hise.*

Use and Abuse of Electric Headlights on Mining Locomotives

(*Continued from page* 1060)

to bring out clearly that no matter how good the reflector or how high the candle power of the light source, a good headlight cannot be obtained unless the light source is properly located.

In breaking a 4-amp. arc circuit a good switch must be used, one that will stand up for a long time. Fig. 24 shows a multiple break switch which meets fully the severe service incident to frequent interruptions in an arc circuit.

In Fig. 25 the switch is shown with the barrier removed and the cross bar broken away to show the connection between the adjacent switch blades *B*. This switch is of the quick-break type and has the advantage that it must be fully closed else the spring *C* will throw the handle back to the off position. When the switch is closed the bottom of the handle *D* fits in a recess in the cover at *E*, and is held there. The switch is exactly what the name implies—that is, multiple break. In ordinary knife switches the arc is broken in one place only. This multiple break switch breaks the circuit in four places.

The switch blades *B* are so shaped that at the instant of closing contact is made along the entire face of the clips *E*. Furthermore, the edge of the switch blade is bevelled so that a positive contact is insured. With this switch there is no such thing as point contact between the edge of the blade and face of the clip, but positive contact over an area greater than sufficient to carry the current. Such construction means long life to the switch parts.

This multiple break switch is a composite affair, which can be made into any one of five types by merely changing the back connections. It may be used for any of the following: Single pole, single throw (Fig. 26); single pole, double throw (Fig. 27); double pole, double throw reversing (Fig. 28); double pole, single throw (Fig. 29); double pole, double throw (Fig. 30).

These figures show the bottom of the switch with insulating cover plate removed. The various connections, as indicated above, are also shown. Connections 29 and 30 are seldom used in headlight work. However, this switch is useful wherever an ironclad, barriered switch is wanted. In every case the live line is connected to the front of the switch at *AA'*, and the headlight is connected *BB'*, *C* or *C'*, as is necessary for the connection desired.

The present balance of transportation is a great reduction in the proportion of the cars (normally) furnished for the transportation of coal. The railroads, however, are consuming their full quota of coal, so that while under favorable and natural conditions 35 tons of coal would be moved, out of each 100 tons of freight there is now being moved much less coal. The entire coal shortage is thrown upon the industries of the country and the domestic users, who, instead of having a coal supply equal to two-thirds of the total coal movement, are reduced to a small and continually diminishing ratio, and this in a time when every effort is being made to stimulate the industrial effectiveness of the nation.

Annual Meeting of the Coal Mining Institute of America

By FRANK H. KNEELAND
Associate Editor *Coal Age*

THE annual meeting of the Coal Mining Institute of America, held in the Chamber of Commerce Building and at the Fort Pitt Hotel in Pittsburgh, Penn., on Wednesday and Thursday, Dec. 4 and 5, 1918, was one of the most interesting and enjoyable that this organization has ever held. The biggest session, from the standpoint of numbers at least, was the institute dinner held in the English Room of the Fort Pitt Hotel, there being between 350 and 400 members and friends present.

The session of Wednesday morning was largely taken up with the election of officers. When the balloting was completed, it showed that the following men had been elected to the offices named: President, E. N. Zern; first, second and third vice presidents in order named, Messrs. Fohl, Maize and Arkwright; secretary-treasurer, H. D. Mason, Jr.; the executive board for the ensuing year will consist of Messrs. Affelder, Walsh, Pollock and Hanford.

After the election, the institute proceeded to the discussion of the first question in the question box. This read as follows: "What effect will the conclusion of peace negotiations have upon the labor supply in and about the coal mines?"

Without going into detail, the discussion on this question brought out the following salient features: It is believed that there will be no inrush of labor following the ratification of peace. Probably as high as 35 per cent. of mine laborers will return home. If the Central Powers have to pay large indemnities, laborers will probably attempt to leave those countries. The restriction of emigration and the indemnities will doubtless prove potent factors in the situation.

Some Actual Figures

A recent canvass of steel workers at a certain plant in Ohio showed that 25 per cent. of the laborers intended to stay in America. Another 25 per cent. anticipated returning to Europe for a short time, after which they would come back to this country. The balance, or 50 per cent., of the men canvassed intended to go to Europe and there remain permanently. In another instance, 56 men were interviewed at a coal plant. Of these, 25 expected to return to Europe. At another plant 40 men were canvassed. Ten of them, or 25 per cent, expected to return home. In another instance, of 55 miners canvassed 23, or 36 per cent., intended to return to Europe. Of 58 day hands, 28, or 48 per cent. of the total number, expected to return to Europe.

Thus, taking an average of all the foregoing figures, approximately 40 per cent. of the foreign-born laborers, or unskilled workmen, anticipate returning to the lands of their nativity. Under existing circumstances and the conditions that have prevailed throughout the world during the past five years, these men are not altogether to be blamed for their anxiety concerning the condition and state of their friends and relatives. On the other hand, with the reëstablishment of mail communications with what might properly be termed the beleaguered nations, or Central Powers of Europe, the anxiety of these men might be somewhat set at rest; and they may change their minds about returning to their native countries.

Another speaker on this subject stated that of 607 employees of one company, 87 anticipated returning to Europe temporarily, while 61 expected to go and stay. Thirty-six were doubtful as to what they would do, and 12 said they had friends who expected to come here.

It was suggested that some of this exodus of labor might be counteracted by inquiries concerning friends and relatives in Europe directed through the American Red Cross. Such inquiries might well be handled through the offices of the various coal companies.

Dare They Do It?

Still another speaker pointed out that the countries of Southern Europe are now laboring under popular and somewhat unstable government. It is doubtful if these countries could force their peoples to remain if they wish to emigrate. It was pointed out that under present conditions the various European countries will be much more careful of the restraint imposed upon their citizens than was the case before the war. Wages here are high compared with Europe, and general mining and industrial conditions are much better. These will doubtless play an important part in the labor question after the final peace ratification.

Question 2 reads as follows: "Should the drawing of mine timbers be penalized under the safety standards in computing compensation insurance rates; if so, under what conditions?" The discussion of this question was comparatively short, the principal point brought out being that mechanical means, such as chains or post pullers, should always be used in removing timbers and that this work should be done under the supervision of a competent and careful foreman or subforeman.

Question 3 was then taken up. This question reads: "To what extent can the water-gage chart be used as an index to the ventilation conditions in a mine?" The consensus of opinion brought out in this discussion seemed to indicate that while the water gage was a good general indication of ventilation conditions, in many instances at least the fluctuations of the recording pen, probably due to eddy currents in the mine passage, were so violent and frequent as to render the record of little specific application. It was pointed out, however, that these rapid and violent fluctuations might be somewhat steadied down by almost closing the connection between the recording gage and the orifice of the tube extending into the air passage. Thus, if a valve was located in this air pipe, cracking the valve instead of

opening it wide would tend to steady down the recording pen of the instrument.

The fourth question, "Has the law permitting the employment of non-certified officials in coal mines been detrimental to their (the mines) efficient and safe operation?" brought out considerable discussion, which at times waxed hot and almost acrid. It was stated that the change in the law permitting the employment of non-certified foremen had had no effect in the anthracite field. Some of the bituminous operators have taken advantage of this law and employed men who did not hold certificates. It was admitted that uncertified men were often incompetent, and that a certificate was an index but not a guarantee of competency.

One speaker stated that 28 men in one inspection district are mine foremen without certificates, and that accidents have increased in this district largely on this account. It was also brought out that due to the high wages paid to the miners and comparatively low wages paid to mine foremen, many certified men were loading coal.

One speaker brought out the point that operators are not always competent to pass upon the proper qualifications for their mine foremen, and there is legally no one to pass upon the operators' competency in this direction. One state mine inspector was emphatic in his assertions and made the statement that the operator who allows an uncertificated man in an authoritative position in his mine is a criminal.

Discussion of Question 5, "What are you doing to increase the efficiency and steady working of your employees: with what success are you meeting?" was then taken up. It seemed to be the consensus of opinion that in order to secure continuity of service from miners it was necessary to offer them certain inducements other than high wages or bonuses. In other words, an incentive to work must be given. Among the inducements that might be offered, the sale of company houses was mentioned. In some instances, such a plan worked well. One company tried it some years ago and sold about 30 houses, but this idea does not work with equal effect during good and bad times. The men regard the purchase of a house as a kind of fire insurance—that is, an insurance against getting "fired."

Full Payment Means a Long Wait

Another speaker brought out the point that it would probably be better to sell the man his plot of ground first and then build or offer to build upon it a suitable house according to the man's own plan. Many of our miners do not like the idea of paying out money, so much a month every month, for a considerable length of time and having nothing definite—that is, nothing in the form of a deed—to show for their investment until the entire amount is paid up. This plan of selling the land first and the house afterward has been tried in the anthracite regions with good success.

As another inducement for his men to stay on the job, one operator gives his store patrons a check covering the profits of the store. This is not a due-bill on the store, but a real check redeemable in real money at any bank. This has had a good effect upon the men. Probably, however, none of these expedients alone will answer the purpose, and it will doubtless be necessary, if men are to be retained in satisfied employment, to offer many other inducements than those mentioned. Among these might be noted proper living conditions, good school facilities, sanitary surroundings, etc.

Question 6 read: "Are roller-bearing wheels too delicate for mine cars?" This question brought forth some discussion. It was stated by one speaker that it was a wrong principle to put roller bearings of any kind in any car wheel proper, the best place for them being in a journal box. Another speaker, who illustrated his talk with several lantern slides, showed roller bearings that had been in use for several years without losing their efficiency. It would appear that the test of continuous use would be the best and only satisfactory answer to this question.

Alternating vs. Direct Current

Question 7 was next taken up. This question read, "Is the underground use of alternating current more hazardous than the use of direct current?" One speaker stated that in one operation several alternating-current mining machines have been successfully used for something like six years. These have given no more difficulty nor have they proved any more dangerous than the ordinary direct-current machines. Another stated that alternating current of equal voltage appeared to be safer than direct current. This is probably due to the fact that with direct current, touching one conductor is enough to give a person a shock, while with alternating current it is necessary to touch at least two.

Another speaker discussing this question stated that he had always considered 440-volt alternating current as being as dangerous as 500 volts direct current, but that he considered both of these voltages too high. In his judgment, it was unnecessary to carry the potential of underground circuits, at least those so placed that men might come in contact with them, at above 220 volts for alternating current or 250 volts for direct current. In stationary operations under ground, it is in many instances possible to carry high-tension wires properly insulated in conduits directly to the terminals of the machine. The alternating-current motor, since it is usually boxed in and has no live parts touchable by anyone if properly and permanently installed, is comparatively safe. However, high voltages underground should be avoided if possible.

The discussion narrated above carried the meeting to the close of the afternoon session. The next session was in the evening, in the English Room of the Fort Pitt Hotel, and consisted primarily of supper. After the eatables had been disposed of and cigars had been lighted, a short report of the condition of the institute was made by the retiring president, Mr. Affelder. This showed the institute in a flourishing condition, both in numbers of members and in finances.

President-elect Zern was then introduced and made a few remarks. Unfortunately, James B. Neale, production manager of the United States Fuel Administration, could not be present at the institute supper, as his presence was necessary in Washington.

Dr. Downey was then introduced and made a short talk on industrial insurance and workmen's compensation. The cost of this insurance in the bituminous region averaged about 5c. per ton, while for anthracite

it was from 8 to 10c. During the past few months, for each million tons of bituminous coal mined there have occurred three deaths, one disability and 20 to 30 compensable disabilities, or those entailing the loss of two weeks or more time. He stated that coal mining was inherently hazardous. In cigar manufacturing the hazard was represented by $0.0015, while for coal mining it was represented by $2.

Captain H. D. Trounce, of the 606th Engineers, was next introduced. Captain Trounce, at the beginning of the war, enlisted in the British Royal Engineers, and took part in the underground mining in Flanders and in the Vimy Ridge country. He vividly portrayed the excitement and danger of mining under No Man's Land.

Seward E. Button, successor to James E. Roderick, deceased, was then introduced. He read a short paper complimenting the individual members of the organization on their work during the war and pointing out the possibilities of the future. He stated that the casualties in mining during the times when every effort was being made to increase and maintain a high output were only slightly greater than those in peace times. In conclusion, Mr. Button urged the Americanizing of the foreigner. He stated that naturalization was not sufficient to make a good citizen out of the man who, for various reasons, seeks our shores and sojourns among us.

Describes Gas Investigations Work

Colonel G. A. Burrell, chief of the Research Division of the Chemical Warfare Service of the United States Army, was then introduced. Colonel Burrell has had charge of important gas investigations work for the Government, and was well qualified to speak upon his subject. He explained that before the war started, Mr. Manning, of the Bureau of Mines, had offered the War Department the facilities of the bureau so far as gas study was concerned. His offer was accepted and the present research organization is largely the outgrowth of this acceptance.

Gases used in warfare at present are of four types: Tear gas, respiratory gas, skin irritants and sneezing gases. The respiratory, or lung-attacking, gases were first used, the first ones to be employed consisting of chlorine and phosgene. These, while quite deadly in their effect if inhaled in sufficient quantities, could be easily guarded against with suitable gas masks. The most difficult gases to contend with have been the skin irritants, of which mustard gas has been the one most commonly used. Colonel Burrell explained that simultaneously with the perfection of gases had come the perfection of gas helmets. These have been developed from simple gauze bandages worn over the mouth and nose and saturated with certain chemicals to the present so-called "fighting helmet" employed by the United States troops. This helmet is so arranged that breathing in or through it is little more difficult than breathing without any mouth and nose covering. Also, the instrument is so arranged that the inhaled air, before reaching the mouth or nose, impinges upon the eyeglasses or windows in the device. This simple expedient insures clear visibility at all times.

On Thursday morning, Dec. 5, the institute reconvened in the auditorium of the Chamber of Commerce Building. Consideration of Question 8 was then taken up. This reads: "In what way can the conservation of material and supplies be best effected both inside and outside the mines?" The principal paper in this discussion was delivered by Mr. Jones, of the Du Pont company, and related to the storage and use of explosives. As this paper will appear in the Dec. 19 issue of *Coal Age*, a further discussion of it here is unnecessary.

Question 8 was the last in the question box, and after the discussion had been disposed of the institute proceeded with the presentation of four extremely interesting papers. The first of these was "The Elimination of Power Losses," by Graham Bright, engineer in charge of the Mining Division of the Westinghouse Electric and Manufacturing Co., of Pittsburgh. This paper was printed in *Coal Age*, Dec. 5, page 1021, and therefore requires no further discussion here, as it can stand on its own merits.

A paper entitled "Underground Coal-Loading Machinery," by E. N. Zern, was next presented. This was elaborate and full and took a considerable time to prepare. Mr Zern was at many times thoroughly flooded with questions pertinent to the use of mining machinery.

"The Use and Abuse of Headlights on Mine Locomotives," by W. K. Mackall, was presented at the afternoon session. This was profusely illustrated with lantern slides. This paper appears in the current issue, and, like the one mentioned above, can stand on its own merits. "The Preservative Treatment of Mine Timbers as a Conservation Measure" was the next paper, and was presented by Kurt C. Barth. This paper was also printed in *Coal Age* for Dec. 5, beginning on page 1025.

This completed the program for the afternoon meeting. Much interest and enthusiasm were manifested, and no one who attended the meeting could come away doubting the usefulness and efficiency of the organization. Much of the success and present strong position, both numerically and financially, of the Coal Mining Institute of America has been due to the zeal and untiring efforts of the retiring president, W. L. Affelder. The incoming president, or the one for the year 1919, is also a man of much zeal and thoroughness. If he handles the affairs of the institute as thoroughly as he handled his subject on underground coal-loading machinery, no one need worry concerning the future of the organization.

Will Maintain Prices to End of Coal Year

Announcement that the price schedule might be lifted and the zoning system discontinued on Dec. 15 brought forth such a protest that it is understood no change will be made prior to Apr. 1, the end of the coal year. It would be manifestly unfair to dealers, it is held, who have been forced to stock up with low-grade coal. If the bars are thrown down at this time, it would be next to impossible to dispose of their holdings with higher grade coals on the market. In the same way, it would be unfair to industrial consumers who had stored lower grade coal. In addition, it is believed the effect on labor would be such as to precipitate a serious situation.

Fuel Administrator Garfield Resigns

Dr. Garfield's resignation came as a surprise to the Fuel Administration, as well as to the general public. The interpretation placed upon his resignation was a surprise to Dr. Garfield himself. The facts of the matter are these: In an informal personal letter Dr. Garfield called the attention of the President to an urgent situation which had been precipitated at his college by the withdrawal of the student army training corps. He explained that the situation is such that he feels it his duty to devote a portion of his time, from now on, to the college. As the President was on the point of leaving for France, Dr. Garfield felt that it would be only proper that he place his resignation in the President's hand with the understanding that he would continue to give the Fuel Administration a portion of his time. It is understood that the President accepted the proposition exactly as stated by Dr. Garfield. The announcement, unsupported by the other facts surrounding the tender of the resignation, led to much speculation, some of it going so far as to declare that a break had occurred between the President and Dr. Garfield because Dr. Garfield did not approve of the President's trip to France. It is Dr. Garfield's intention to spend one day each week, or more if necessary, looking after Fuel Administration matters, even after he takes up anew his duties at Williams College.

Will Investigate Availability of Lignite

The bill providing for an investigation of lignite coal has been reported favorably to the House by the Committee on Mines and Mining. The committee amended the bill to exclude peat and reduced the appropriation from $150,000 to $100,000. The bill was introduced with the explanation that "the object of the investigations proposed by this bill is to demonstrate the commercial practicability of the use of our vast lignite deposits, which constitute one-third of the coal deposits of the nation, a vast volume of these deposits being upon Government land, and owned by the Government. The carbonizing of lignite has passed the laboratory stage, and the problem now to be solved is to work out the results obtained in the laboratory on a large commercial scale, so as to demonstrate its practicability from a commercial standpoint to such an extent that private enterprise and capital will undertake the development of this wonderful resource." The committee submitted a report which goes into an extensive analysis of the present lignite situation.

Relinquishes Control of Soft Coal

Requisitions made by the Fuel Administration for shipment of bituminous coal to industrial plants have been canceled. In the future all industrial users must arrange for their own supplies. Retail dealers, hospitals, schools, public utilities, the Government departments and state and municipal agencies also have been asked to look out for their own fuel. The Fuel Administration, however, will maintain a portion of its distribution bureau so as to look out for such consumers and domestic users in case of necessity.

Recent Changes in Coal Zones

The market for the high-volatile coal in the Logan and Kanawha fields has been increased by the modification of Zone M-2. The high-volatile producers in Kentucky also may sell over a larger territory by the change in Zone M-4. Zone L also has been changed so as to afford additional territory to the coal produced in the Kanawha district. The consuming district of Zone M-3 also has been enlarged to permit of wider shipments of the high-volatile coals of West Virginia and Kentucky. Similar action has been taken in Zone M-1.

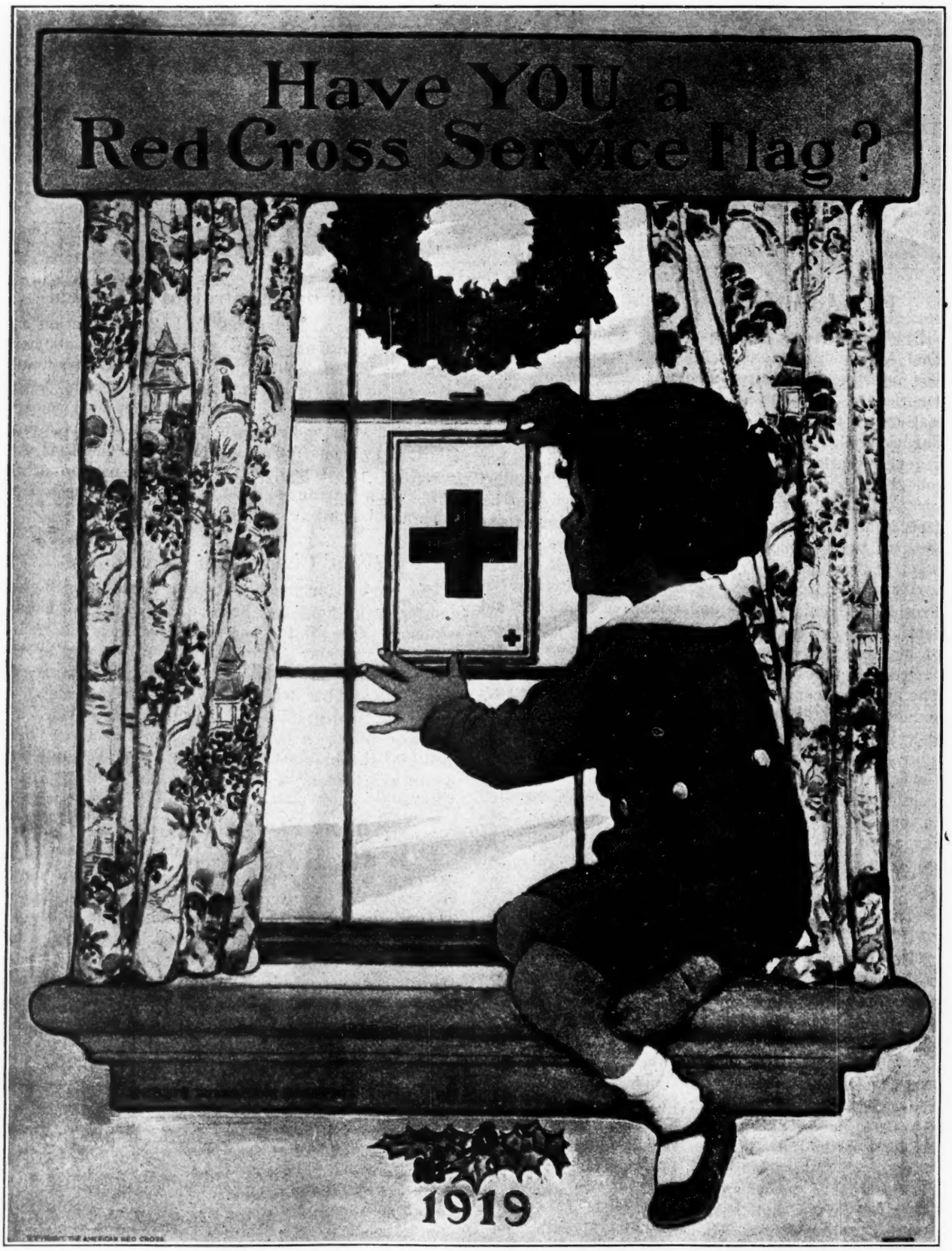
Many Fuel Officials Resign

W. H. Warren, of Richmond, Va., who has been in charge of coal consumers' needs in several of the southern states for the Fuel Administration, has resigned. J. O. Knight, of Baltimore, who had charge of similar work in Pennsylvania, Maryland and Delaware, also has resigned. Alexander Yule, of St. Louis, who directed the distribution of blacksmith coal, also has returned to his personal business. The resignations were handed in because the changing conditions have so reduced the work as to make the services of these men unnecessary.

To prevent any increase in the price of gashouse coke, based on the recent anthracite advance, an order has been issued fixing the price on the basis of anthracite prices as of Oct. 1.

Coke distribution has been placed in the hands of state fuel administrators. They also may give permission to use coke as a domestic fuel in cases where they deem it necessary.

Canadian permits for imports of bituminous coal into Canada will not be required in the future, the Fuel Administration has announced. The requirements with regard to anthracite shipments remain the same.



The Red Cross seeks a 100 per cent. membership for 1919. Children and parents with one accord should enlist under the great international banner of brotherhood and service, for, by its ministry of mercy, the Red Cross will complete the victories nobly won in the foughten field. None are too young to be helping toward a better and brighter world.

EDITORIALS

Contest Between the Head and the Hand

IN THE United States, there have always been some men who, laboring with their hands, have made large earnings. Those who labor with their heads, especially those in inferior capacities, have too often been quite a little jealous of the larger incomes made by these manual laborers. "Brain labor," they assert, "should receive greater consideration." The complaint is general that "I have been 25 years acquiring my experience, and yet I only make as much as a man who works with his hands."

The grumbler overlooks the fact that the manual laborer has been getting during that time, perhaps not what we somewhat loosely term "experience," but at least adaptability to his tasks—dexterity, strength, hardiness, hardness and what not. Perhaps his growth toward greater physical development of the kind needed for his work soon reached a limit, but at least the same might be said of the brain worker. If the latter has progressed from one form of employment to another, he doubtless lost in that progress many of the peculiar adaptabilities he successively obtained. If he stayed at the same work, it is likely that his advance largely ceased after the first year of his employment. It is not clear therefore that years of experience at mental labor have any more claim than years of development at physical labor.

There are, of course, certain employments for which much mental equipment is needed and an observation extending over years—employments requiring special aptitude; yet occupying positions of that kind are often men who do not have that aptitude but claim the emoluments which commonly go with the position or are believed so to go, or which we believe should go with such a position.

To these men it seems they should be paid rather by the measure of their ambition and pretentions than for the measure of their mental attainments. A passable mechanic may have been spoiled to make an indifferent brain worker, and the product, a substitute of inferior value, proclaims its right to payment as of the material for which it is substituted.

As a matter of fact, the plodding workman who denies himself the ambitions that we all more or less have—the ambitions to exercise authority, to wear fine linen, to labor with the head instead of with the hand—is entitled to a reward for his patient plodding at unwelcome toil. His task may be one of endless uninteresting repetitions; it may be hedged around with a multitude of discomforts and dangers; it may bring little reward but money; it may promise only irregular employment; it may have to be conducted in solitude; it may involve a weary travel to work night and day; it may necessitate changes of clothing and time-consuming ablutions; it may keep a man from his family.

It is not unreasonable, therefore, to conclude that certain kinds of mere manual labor may well pay higher wages than certain kinds of brain labor, especially seeing that there are many in all walks of life who are now fitted by education for the latter.

It is often alleged that the worry of authority should be compensated as well as the labor of its exercise. But no one is paid to worry. As worry is a disease, it should rather be penalized than rewarded. Some men fag early at their work. We cannot pay them for their abnormal fatigue, and we cannot reward a man for abnormal worry.

The man who worries easily may be, it is true, a good brain worker, just as a man who is fatigued easily may be a good mechanic; but the worry, like the fatigue, cannot be made the basis of compensation. A healthy spirit would be as free of one as the other, under normal conditions, so the less said of worry the better.

Again, the economic value of the brain worker is alleged as a cause for consideration, and this may be or may not be a good argument. Twenty-five men under the direction of a foreman may do as much as fifty men without. "Clearly," says your economist, "that one man earns as much as twenty-five and is entitled to compensation accordingly." That is true if the character of the boss is the cause of the increased work; but if any one of the twenty-five other employees could qualify in a short while to do as well in the position of boss as the twenty-sixth, what becomes of the title of the foreman to the larger salary?

With so many persons supplied by the state with the first steps toward a qualification for a job of headwork, the position of the brain worker becomes less and less remunerative. More and more are willing to give $5, $10, $20 a month to be boss, and are willing to accept the worry of the task for the pleasure of the exercise of authority. It is not a man of low instinct who seeks such authority. The man may be courteous and modest enough in its exercise, but he likes the intellectual development that authority confers, and he craves something on which his mind may continually busy itself.

There are two contrary theories of wage compensation. We hold to both of them as each in its turn suits our best interest. There is the rule of the "fair" wage and that of the "economic" wage. A brain worker may save others so much labor and unpleasant toil that his work has a high economic value. It is impossible to determine just what that wage is by argument. We are forced back into the theory of the economic fatalist, that the reward of the employee is proportioned automatically to the economic value of his services, or at least tends to be so adjusted.

It is about as true as the doctrine of providential fatalism. We are now being generally taught that "divinity" does not wholly "shape our ends, rough-hew them how we will," and that we can avoid sickness by

prudence and accidents by care. So does it fare with our belief in economic fatalism. Roughly speaking, economic laws do put us in certain categories and provide what the payment shall be for certain services, inconveniences and helpful abnormalities of character, mind and skill, but there is a degree of freedom also entering in. We break away from the economic fate by individual action, and still more by concerted action. Still the economic law will on the whole determine more readily than any law of fairness the right status of an employment.

Everywhere is the force of gravity, yet there are waves in the sea. Everywhere are economic laws, yet there are men over-rewarded and men under-rewarded, and all we can say is that a fair wage based on mental premises would not be as likely to solve the problem as correctly as it will be solved by the ebb and flow of the economic tide.

Let us not be jealous of manual labor. If it be not worthy of the higher rewards it has been getting, the law of economics will correct the unfairness by a readjustment of the wage paid for the work of the brain. The readjustment, if warranted, will inevitably come, though there may be some delay before it is accomplished.

Just Enough Is Never Enough

THE BRITISH are advocating Government ownership for railroads. They say that with a national monopoly it is possible to nicely regulate means to ends so that there will be less waste of labor and material. Before the war Great Britain often had three trains running where one or two now carry all the people who desire to travel. The project all sounds unanswerable till we remember how Great Britain has tried to solve just this same problem of adjustment in the telephone service. The British Government has always had that service under its exclusive charge. It has always tried to balance means and ends, but the ends always overtook the means. There was always more business than facilities for business, more demand than supply. Britannia, telephonically, has always had a hobble skirt.

Whenever industry is asked to make its demand, before that demand is supplied, by the very nature of things the supply will lag behind the demand, and even the demand itself will lag. We have been accustomed to have corporations coaxing us to develop our business methods. Now we are likely to have Government managers requesting us to do without certain accommodations which we are anxious to receive and willing to pay for. We shall be asked to wait till there are enough persons making the demand to make the improvement 100 per cent. effective. We shall find all our privileges restricted and we shall not be allowed to complain, for to complain of the Government is to make a protest against the flag.

One of the beauties of profitable private ownership is the bounty of the accommodation it supplies. When times are normal we do not have to make reservations in advance if we desire to travel. We do not have to requisition railroad cars months in advance. But under Government ownership and that wonderful system of balancing of needs to provisions, we shall always find that there is no surplus. That which has made us wage the war successfully has been our reserve of force and material. Had we been bound, as Government regulation would have us bound today, we could not have turned ourselves in the narrow quarters of our accommodations.

Whether the Government holds on to the railroads or relinquishes them, we face an increase in the transportation charges. We wish to go back to the old day of too much railroad rather than too little railroad. We want too many cars, too many miles of track, too many trains rather than too few. The railways broke down because they were given minima instead of maxima. They will break down again, and repeatedly, if they are going to be run or regulated by a pinchbeck policy. A little extra power will do no harm.

An operator said once that he had no trouble with his engineers. He said they figured and figured and figured, and then added 10 per cent. for contingencies. Then the operator took the figures and doubled them. The result gave perfect satisfaction. What was a good rule for that operator is a good rule for the nation.

Our theoreticians at Washington are like the man who rationed his horse a little less every day till his steed was subsisting on one straw every twenty-four hours. Just when this bold investigator in the art of horse *ménage* was about to make his triumph public, the horse died. It will be the same with the iron horse.

If we regulate prices for transportation to suit certain favorable conditions, if we place them so that only the well favored prosper, we shall have no railroads. The survival of the fittest is rubbish. There are so few fittest. At best it must be the survival of the fit. But the regulators of industry in their zeal would rule out all but the fittest and the fittest cannot do all the work of the world. Some of the burden must be carried on the backs of the merely fit.

Coal in the Readjustment Period

THE coming of peace has brought with it complications no less involved than those of war. After creating an abnormal demand for the products of industry, the Government has been forced to partially liquidate its war business. As a consequence, industry is now driving about in an endeavor to readjust itself to a peace basis. In the interim the coal industry finds itself marking time.

In an effort to inject a little action into this listless atmosphere, it has been suggested that the Fuel Administration remove all restrictions on the shipment and sale of soft coal. In other words, that the trade be once more placed upon a competitive basis. If the Administration complies with this suggestion the industry will be confronted with a highly interesting situation.

Will the relinquishment of control provide an additional market for those Middle West mines now restricted in their output? What will become of the many contracts that have been entered into with the approval of the Fuel Administration and stipulating the last Government price as the ruling quotation for the life of the contract? A number of other questions present themselves, and it is evident that it will take the best brains available to answer them to the satisfaction of all the parties concerned.

DISCUSSION BY READERS

Hindrances to Coal Production

Letter No. 8—The letter on this subject that appeared in *Coal Age*, Nov. 7, p. 873, interested me greatly. I was led to think, however, that it laid too much emphasis on the matter of intemperance among the miners. There is, of course, no question but that booze plays a large part in reducing the production of coal. Often, when you ask a man why he is idle, he will tell you that he is sick; but, in fifty per cent. of the cases, investigation will show that the sickness started in some saloon, or possibly a christening, or a wedding celebration.

A volume, almost, could be written on the many different things that interfere with the efficient operation of the mine and hinder the production of coal. They are multitudinous. Some of the more important causes are the following: Bad or worn-out machinery; insufficient equipment of the kind best suited to perform the work required; bad haulage roads; poor drainage; defective ventilation in the mine; and, last but by no means least, poor living conditions for the miner and his family. All of these and many other things help to keep down the productiveness of a coal mine.

Effect of Poor or Inadequate Equipment

Experience in different mines has led me to believe that, perhaps, the greatest loss in coal production is due to worn-out machinery and antiquated methods of mining. At one mine, for instance, the coal was hauled by a gasoline motor that had performed its share of service a year or two before it fell into my hands. We would work on that motor for hours to get a day's run out of it, only to have it break down when we were in the greatest need of coal. At such times, the entire mine would stand idle, until we could get the machine into running order again. The same is true of other mine equipment, such as pumps, mining machines, and like apparatus used in the operation of a mine.

Frequently, we find mines where the seam pitches so as to cause heavy grades in the rooms, and the miner is compelled to push his cars to the face. Sometimes, it is all that he can do to get his car up the grade and in a position to load. The energy he expends in this manner should have been used in mining and loading his coal. Although operators are now waking up to many of these conditions that hinder the work and reduce the output of their mines, it is a fact that too many of such hindrances still remain.

Living Conditions Assist or Retard the Work of Getting Out Coal

Many people do not realize how large a part bad living conditions play in the production of coal. When a miner has a good cozy house to go to, after his day's work is done in the mine, it gives him an incentive to work harder, in order that he may make his little home even more comfortable. He becomes more thrifty and an increase is noticeable in his daily tonnage.

While the things I have mentioned thus far are matters that the operator must improve if he would increase the capacity of his mine, there are other things we can all do that will greatly assist in getting out more coal. The efficiency of the foreman, for example, plays no small part in making a mine produce a good tonnage. In the majority of cases, the falling off of the day's output is largely due to the mistakes of the foreman or his lack of attention to matters in his charge. Poor work performed by trackmen, timbermen and other daymen, resulting in bad haulage roads, poor drainage, bad air at the working face because of leaky doors and stoppings, make it impossible for a mine to produce to its full capacity.

A matter of greatest importance is the disposition of a foreman to ignore the little troubles of his miners, which a single word or act of his would help to overcome. An inexperienced miner will often be observed performing his work in the hardest possible manner. The helping hand of his foreman, at such times, will result in the man's getting out more coal by far than if the foreman resorted to cursing and swearing or reprimanded the fellow sharply for his ignorance. In closing, I want to say that we can all do something to increase the production of coal if we only use our heads a little more than we have been in the habit of doing heretofore.

J. H. TIPTON.

Landstreet, Penn.

Calculating a Room Switch

Letter No. 1—I was glad to see the question of a correspondent, in *Coal Age*, Oct. 17, p. 756, asking for the proper dimensions of a room switch and how to ascertain the number of frog that will give the best satisfaction. To my mind, this is one of the most important features to be considered in the development of a new mine, and one that is often not given the attention it requires. Unless that is done, much trouble is bound to follow.

While it is customary for a company to have this work done by a mining engineer, it is well for every mine foreman to be able to work out such problems for himself. It will enable him to understand better when a room switch is well laid. The method of calculating the number of frog to be employed and the required dimensions of a mine switch has been fully explained at different times in *Coal Age*, and I have found that if the figures given are followed there will be no trouble.

Having selected the right frog, find the length of lead rail required by multiplying the frog number by twice the track gage, in feet. Then, find the radius of the curve by multiplying the length of lead rail by the frog number. In a long experience in laying

switches in a mine in southern Illinois where gathering motors were used, I found no trouble when using these rules.

Practically, the first question to be decided is, What frog number will best suit the conditions. In the case mentioned in this inquiry, there should be no serious trouble in laying down a switch to enter a room, which is here said to be turned with a width not exceeding 12 ft. In laying the curve beyond the frog, however, it may be necessary to crowd the rib of the room neck and widen out on the opposite side.

PRACTICAL CONDITIONS DETERMINE FROG NUMBER

In deciding these questions, one must know the kind of haulage that is to be used, the weight and size of locomotive, wheelbase and size of wheel and the speed at which the cars must move. These data will greatly assist in choosing the right frog. For example, in the present instance, let us assume that a gathering motor weighing 6 or 6½ tons is to be used, and the capacity of the mine cars is 2 or 3 tons. In that case, I would select a No. 2 frog. The track gage being 42 in. (3½ ft.), the length of lead rail required is, then,

$$l = 2gn = 2 \times 3\tfrac{1}{2} \times 2 = 14 \text{ ft.}$$

The radius of the curve, in this case, is

$$R = ln = 14 \times 2 = 28 \text{ ft.}$$

I would use a latch not longer than 3½ ft. In running gathering motors and laying track after them, I have found it a good scheme to have the latch short enough that it can be kicked or moved freely between the first car and the locomotive pushing the trip. In other words, the last wheel of the rear car of the trip must have cleared the latch before the motor trucks reach it. I have often found this to be a practical point worthy of observing carefully.

Cleaton, Ky. OSTEL BULLOCK.

Letter No. 2—Replying to the request of a correspondent who asks for the proper dimensions of a room switch, and the number of frog that will give the best satisfaction under the conditions he mentions, I am glad to give him the benefit of my own experience along this line.

Owing to the bad-roof conditions it is stated that the rooms, in the case under consideration, cannot be turned a greater width than 12 ft., and I assume that the entry is of the same width. This being the case, it will not be possible to act upon the old-time slogan of the best practical mine tracklayers, which was, "The longer the switch the better the haul," and adopt a longer switch than the space will admit.

The correspondent has failed to state the system of haulage he is to employ. However, as this is a new mine, one might assume that the intention is to use a gathering motor for collecting the cars from the rooms. It is stated that the track gage is 42 in. and the length of car 8 ft. 9 in.

For a number of years, I have been hauling coal over all kinds of track and in the use of almost every kind of haulage system, including mule, rope and motor haulage, and want to say that the old-time slogan just mentioned is a most important item in mine haulage, if one is to secure the best results. My plan is always to use as light a curve as possible, which means the lengthening out of the switch rail.

In the present instance a 12-ft. collar bar will span the mouth of the room, and this must be set so as to favor the longest curve possible on the room switch. Taking everything into consideration, let me suggest that a No. 2 frog should be used. Estimating the length of switch rail for this frog, according to the method previously described in *Coal Age*, [Vol. 10, p. 673] we find for the required length of this rail,

$$l = 2\ g\ n = 2 \times 3\tfrac{1}{2} \times 2 = 14\ ft.$$

This is the length of the lead rail reaching from the point of switch to the point of frog, using a No. 2 frog, when the track gage is 42 in. or 3½ ft.

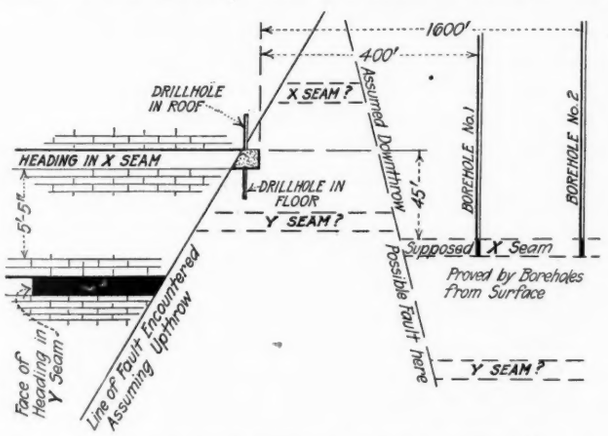
In order to bend the rails to the proper curvature, the length of the radius of the track center is calculated by multiplying the length of switch rail, as just found by the number of the frog, which gives, in this case, $2 \times 14 = 28$ ft. radius to the center line of the track. I shall be glad to learn of the experience of others along the same line. CLAUDE W. CARRUTH.

Edwardsville, Ill.

Locating the Coal Beyond a Fault

Letter No. 2—After a careful study of the sketches showing the profile, cross-sections, plan of working and legend, submitted by "Superintendent," in his inquiry, Oct. 24, p. 797, it appears to me that he was proceeding on the right track in driving entries and prospecting the line of fault to ascertain its nature. However, it is my belief that the main headings were not driven far enough through the fault before putting the drillholes up and down in the roof and floor of the heading.

It is clear, from a study of the six cross-sections given in the inquiry, that this fault is an upthrow.



UPTHROW FAULT FOLLOWED BY A POSSIBLE DOWNTHROW

Such being the case, unless the main heading was driven sufficiently far through the fault before putting a drillhole up in the roof, the hole would only penetrate the faulted strata or dead ground, as I have shown in the accompanying figure. The hole put down in the floor of the heading was probably not drilled deep enough. Had this hole been carried a few feet deeper, it is my opinion that it would have found the Y seam, just below.

Referring, now, to the two boreholes sunk from the surface and which appeared to have penetrated the X seam, at a greater depth than was expected, so that

it was thought that the coal struck was the Y seam, it is possible that another fault exists between the one first found and the borehole 400 ft. in advance of the heading. This second fault would be a downthrow, as indicated by the dotted lines in the figure. I suggest this as a possibility, but the actual condition can only be determined by prospecting and carefully studying the strata penetrated by the boreholes. This possible position of a second fault, as shown in the figure, assumes that the first fault is an upthrow and that the coal struck by the boreholes was the X seam.

Further Prospecting Needed

Much satisfaction would have resulted by continuing No. 1 borehole, sinking it 50 ft. deeper. The information thus gained would have warranted the extra cost of drilling. In addition to sinking these holes deeper, I would push the main heading, in the Y seam, to the fault; and, at the same time, drive an uprise from the face of the right-hand main heading, in the X seam. This uprise, or slope, should follow the slip, keeping well in touch with the footwall so as not to miss finding the coal should the fault prove to be an upthrow, as I have assumed. I would also bore downward in the floor of the main heading at least 60 ft.

Should these efforts not succeed in locating the X seam beyond the fault, it will be necessary to drive an uprise on the slope, starting from the face of the heading, in the Y seam, where it reaches the fault. In closing, let me say that the two boreholes mentioned in the inquiry as driven from the surface, appear to be sunk in a valley or hollow. It is well to remember that hollows or valleys on the surface often mark a line of fault or trouble in the strata, and holes in such places may not give the best satisfaction.

Linton, Ind. W. H. Luxton.

Letter No. 3—Reading the interesting discussion that has appeared in *Coal Age*, regarding the method of locating the coal beyond a fault, reminds me of a slip that we encountered in our mine some time since, and which is very similar to the conditions described in the inquiry that started the discussion, Oct. 24, p. 797.

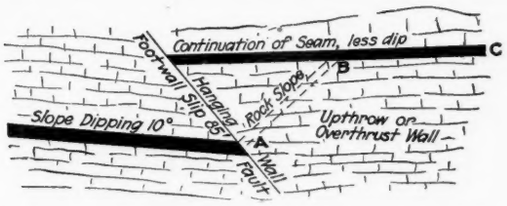


FIG. 1. SHOWING AN OVERTHRUST FAULT

In our case, however, the fault was an upthrow, while the one described in the inquiry is seemingly a downthrow.

Our mine was opened by a slope pitching 10 deg. The condition met when this slope struck the fault is illustrated in Fig. 1. Prospecting showed that the continuation of the coal seam was above. The fault was found to be one that is best described as an overthrust, the strata having been forced upward when the break occurred. The dislocation was 85 ft. measured on the fault line.

In order to continue the work of mining in the seam beyond this fault, we drove a rock slope from *A* to *B*, as shown in the figure. The seam beyond the fault had considerably less dip. An inside hoist was installed at *B*, to haul the coal from *C* to *B* and lower it from *B* to *A* through the rock slope. From the latter point it was hauled out of the mine.

Allow me to suggest, here, that from the description given in the inquiry, it appears to me that the fault

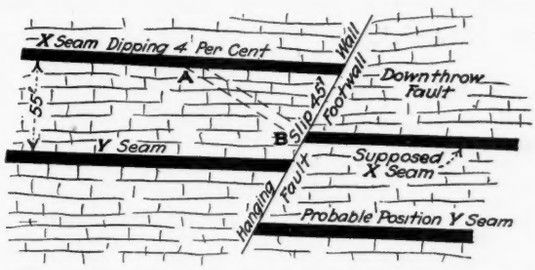


FIG. 2. ASSUMING FAULT TO BE A DOWNTHROW

mentioned is a downthrow, as shown in Fig. 2. There is little doubt, in my mind, but that the coal found in the boreholes sunk from the surface belong to the X seam. In that case, the best plan to follow would be to drive a rock slope from *A* to *B*, starting from the main heading, when the position of the seam beyond the fault has been determined. The coal from beyond the fault can then be hoisted through this rock slope and hauled out of the mine. I submit this, hoping that it may be of some assistance in solving the problem.

E. D. Reynolds, Pres.,
West Blocton, Ala. Blocton Mining Company.

Americanizing the Foreigner

Letter No. 7—It was with peculiar interest that I read the letter of "Optimist," which appeared in *Coal Age*, Aug. 29, p. 415, and has since been followed by others. Many of the statements made in these letters, however, are so wide of my own experience that I cannot resist the desire to comment on a few of them. Certainly the conditions that have led writers to look upon the situation in hand so hopefully are quite different from those it has been my fortune to meet.

In the letter to which I first referred, "Optimist" suggests: "Let the teachers be instructed by mine officials to maintain a high standard of order and cleanliness in the schools." Think of applying this remark to the conditions existing in this state, where the teachers sent by the County school board to the different coal fields throughout the county are not usually the kind of whom much can be expected in the way of setting "a high standard."

Graduates of Graded Schools Sent as Teachers

For example, among the teachers sent out last year were young girls of 18 or 19 years, graduates of graded schools only, who were frequently heard to use such expressions as "them shoes," "have saw," and many others showing a like deficiency in their knowledge of English grammar. Also, for the most part, these girls dressed slovenly and appeared to care little for the work of which they were given charge, their chief

interest being the small salary that they received monthly.

If coal operators look for improvement to come through the work of these teachers and hope that the high standard of living they set before the children will have its influence on the foreign parents and boarders in that community, I fear they will have many, many years to wait before their hopes will be realized.

It may be asked, "Cannot the operators employ a better class of teachers?" Unfortunately, the answer is, "No!" And I must add that few of the companies have any influence with the school board to induce them to send more capable teachers. The idea seems to prevail on the board that the girls sent are good enough for the children they must teach.

Arbitrary Action of County School Board Obstructs School Work

Only last winter, our general manager asked permission of the school board to reroof the school building, at the company's expense. Although the roof was in very bad condition at the time, the board denied the request, stating that a committee attended to that business and it was their duty to advertise for bids before anything could be done. The general manager, however, went ahead and had the roof repaired, and the school started in September.

But, after the school opened, it was the middle of October or the first of November before the books arrived for the use of the children. It is needless to say that, while waiting for the books, little was accomplished although the school was in session every day. There is no truant officer here, and the usual reply to the teacher's inquiry as to a child's absence is, "What's the use of his going to school, he isn't learning anything."

In this camp of 3000 inhabitants, "Optimist's" suggestion that the company doctor could assist in securing clean and sanitary conditions is likewise wide of the mark. The patients, here, will not even carry out the doctor's instructions, unless it pleases them to do so. Last fall, when there was an epidemic of smallpox on this creek, it was impossible to quarantine the people in the houses where the disease prevailed.

Betterment Work More Successful as Aim of Workers is Understood

Speaking about "uplifting" the foreign-born miner another writer, in *Coal Age*, July 25, p. 190, suggests, "Among the employees of every large coal operation there should be a set of men who would act as missionaires of patriotic zeal among the foreign workers, in and out of the mine." Let me say that, in practically every coal camp where I have been located, until lately, I have failed to find one in twenty of the foreigners that did not think that the company officials were trying to beat them.

This condition, however, has changed considerably within the past year or so. Many foreign miners are now joining our lodges, and it is not uncommon to find them playing pool with the office men and other mine officials, with whom they are becoming acquainted. Nevertheless, they still resent the efforts of anyone to uplift them, as they call it.

In contrasting the foreign-born with the American miner, reference has been made to the latter's habits of thrift. In justice to the foreigner in West Virginia, let me say that he is, as a rule, more economical and manages to save more money than the American miner. The latter has usually spent everything and has nothing to draw when payday comes around, but that is not the case with the foreign miner, who generally carries off a fat envelope. Again, it is seldom that a foreign miner leaves town without first settling up what he owes, but this cannot be said of many American miners who would leave the company in debt, if possible.

Red-Cross Chapter Organized in Camp

Of all the efforts that have been put forth in behalf of our foreign miners, probably none have been more successful than those of the Red Cross. Only last year, the wife of the general manager of our company organized an auxiliary chapter of the Red Cross Society in our capital city. A wonderful work has since been accomplished through her efforts.

At first, the women were very reticent in regard to joining, fearing that the company was trying to swindle them out of their money; but time told the story, and these women were taught to make hospital garments and to knit. The head of the chapter went to the schools and told the children that she would meet them in the church every afternoon at 4 o'clock and teach them to knit. In about five months, the children were knitting sweaters for the Red Cross, and their little sisters who were too young to attend school were learning to knit also.

As the result of this woman's work, several hundred dollars were secured in a recent Red-Cross drive; and, on Sunday, from 75 to 100 people attend the church services, instead of 10 or 15, as formerly. Recently, the miners held a festival and other entertainments, in coöperation with the office and store men and realized a good profit for the benefit of the Red-Cross fund.

Results Shown by the General Improvement

Perhaps, one of the greatest benefits resulting from the Red-Cross work, is the fact that school teachers have been secured this year who promise better than ever before. To encourage them, the general manager has given them a cottage where they can all live together. There is, now, hearty coöperation on the part of the parents to make the school year a successful one.

Another noticeable feature is the pride that the women are now taking in their dress and personal appearance. Thrift and good-will is in evidence everywhere. The children are buying War-Saving and Thrift Stamps, as well as the grown-ups. The miners are more industrious and compartively few are leaving the camp. A short time ago a miner asked me to lend him a novel, and when he returned it he asked for another. A year ago that miner would not have read a book if I had given him one; much less would he have come to me to borrow one.

Last spring the company installed shower baths in the electric shop, and the miners were privileged to use them, for a small monthly fee. These baths are now a real pleasure to the men and there is a notice-

able improvement in their appearance and dress. Also, the company has furnished and equipped a children's playground, in front of the company store. This has been a source of pleasure to the children of the camp, and the evening usually finds many grown-up people participating in the fun. It is my belief that the Red-Cross and the war work deserve a large portion of the credit of Americanizing the foreigner in this district.

A READER.

Huntington, W. Va.

Justice to the Miner

Letter No. 9—Following the discussion in regard to justice to the miner, I notice that many persons are loud in their praises and comment freely on the conditions existing in miners' homes and in the camps; but little is said to inform the public on conditions under which many miners work in the mine.

The remark is often made, "Oh, yes, ——— Camp is a fine place in which to live; but I wouldn't work in the mine there, because I can make more money at the place over the hill. Over there, they pay the same price for loading coal in a 12-ft. seam as they pay here, where the seam is only 5 ft. thick and the miner is compelled to brush roof and move rock, with no compensation for the extra work he performs. Over there, the men do not have to push their cars in and out of the rooms; but, what is even more, the treatment they all receive from the mine foreman goes far to make them like the place."

ATTITUDE OF THE COLORADO FUEL AND IRON CO.

Such remarks as those just quoted show the great difference in mines operating in the same district, but under different management. I was glad to read the letter of E. H. Weitzel, manager Colorado Fuel and Iron Co., which appeared in *Coal Age*, Oct. 17, p. 753, pointing out the privileges the miners of that company enjoy, in spending their spare moments in profitable reading, bowling, or playing pool and billiards in the miners' club house operated by the Y. M. C. A.

However, it goes without saying that those miners could not profit by the opportunities afforded them if it were not for the good wages they are able to earn, under the company's management. The miner pays 50c. a month for his membership in the Y. M. C. A., and the same amount for the use of the bath house, to say nothing of the extra expense for ice cream, "near beer," pool and billiards, etc., for which the charges are the same as asked elsewhere.

The miners of the Colorado Fuel and Iron Co. are proud of their club house, and their wives and children go to church and school better dressed, since the saloons were moved off the premises. It can be truthfully said that if the company never did another thing to improve the conditions surrounding their miners, they deserve the highest praise for that one act. The driving out of the saloon from the camp has largely increased the purchase of Liberty Bonds and War-Savings and Thrift Stamps, by the miners. I would to God that the saloon had been made to go long years before.

Another great step forward was the acceptance, a few years ago, by this company, of the Rockefeller Industrial Representation Plan. Personally, I consider this the greatest plan ever devised, in respect to the relations of labor, capital and the public. It is only through such a plan that the coal miner will ever get justice of the kind and quality that he deserves. The plan is in keeping with the great principles of democracy, for which the world has been fighting, today. It guarantees to the individual the right to life, liberty and happiness.

The plan combats the principles of labor leaders, who believe that it is possible for miners to get justice only through lockouts, suspensions and strikes. It teaches the broad principle that if a miner is willing to give his employer all that the latter can rightfully expect, he must not be compelled to demand more for himself, by reason of a pledged allegiance to his fellow workers, who may claim that he should receive more.

In accepting the Rockefeller Industrial Plan, the company are paying their miners, today, more wages than ever before. But, this is not all; they are pledged to pay the same wages that may be paid to any miners in the same competitive field. It is not strange that the miners working for this company appear to be enjoying life.

PRACTICAL OPERATION OF THE ROCKEFELLER INDUSTRIAL PLAN IN COAL MINING

Almost without exception, the miners of the Colorado Fuel and Iron Co. are working steady, have plenty to eat, wear fine clothes, and live in beautiful homes, with pleasant and sanitary surroundings. In fact, they have everything that is worth while. That is the kind and quality of justice one wants to see the miner receive. Under the Rockefeller plan, he is guaranteed the full freedom of a personal manhood, and the same is accorded to womanhood. There is the right to enjoy and develop every opportunity, personal traits of character, freedom of speech and the education of their children.

Such privileges Americanize the foreigner rapidly. All have the freedom to go where they please and to spend their money when, where and as they wish, the only requirement being that they shall obey the laws, rules and regulations of the company, which are common to every well-regulated mining camp in this country. There is guaranteed to every man the right to perform his work unmolested by any individual or set of individuals whose purpose may be to create trouble, strife and discontent.

The influences that have surrounded the miner, through his allegiance to labor organizations, are the evidences of the power of the almighty dollar. Take away the salaries of labor leaders and labor unions would cease to exist. Instead, miners would be organized under a plan similar to that to which I have alluded.

The Rockefeller plan has shown to the world that capital and labor are mutually dependent on each other. The one cannot exist without the other. Their interests are common. When the operator and the miner, representing capital and labor, respectively, clasp hands and are willing to work for higher standards of living, involving their economic, social and spiritual welfare, then justice to the miner will be a reality and justice to the operator will, likewise, be assured.

Farr, Colo. JUSTICE.

INQUIRIES OF GENERAL INTEREST

Direct-Connected and Geared Hoisting Engines

We are hoisting cars at our slope with a 22 x 30-in. first-motion engine. With a steam pressure of 100 lb. per sq. in., the engine makes 50 r.p.m. and hoists the cars at the rate of 1000 ft. per minute.

It is now proposed to change this engine over to a shaft and put in its place a 16 x 24-in. second-motion engine, which is geared 2½ : 1 and runs at a speed of 125 r.p.m. I want to ask what effect the gearing has on the horsepower of an engine. Kindly explain the rule for calculating the horsepower of an engine and state how one can determine whether a certain size of geared engine will pull a certain load at a certain speed.

Greensburg, Penn. MINE ENGINEER.

From the data given, it is impossible to determine whether the geared engine will perform the same work as the larger first-motion engine now doing service at the slope, and which it is desired to use at the shaft opening.

The horsepower developed in an engine cylinder is equal to the total pressure of steam acting on the piston multiplied by the piston speed and divided by 33,000. To find the total pressure on the piston it is necessary to multiply the area of the cylinder by the mean effective steam pressure, which must either be taken from the engine card or calculated from the cutoff of the engine. Assuming an initial pressure in the cylinder of 100 lb. per sq.in. and a ⅞ cutoff, the mean effective pressure in a steam cylinder, at sea level, will be practically 80 lb. per square inch.

The diameter of the cylinder of the first-motion engine, in this case, is 22 in. and its stroke 30 in. (2½ ft.). The area of a 22-in. cylinder is $0.7854 \times 22^2 =$ say 380 sq.in. The total average pressure of the cylinder throughout the stroke is therefore $80 \times 380 = 30{,}400$ lb. At a speed of 50 r.p.m., the engine makes 100 strokes per minute and has a piston speed of $100 \times 2\frac{1}{2} = 250$ ft. per min. The efficiency of a good direct-connected slide-valve engine can be taken as 85 or 90 per cent. The estimated horsepower exerted by this engine is therefore

$$H = \frac{0.85 \times 30{,}400 \times 250}{33{,}000} = \text{say } 200 \text{ hp.}$$

The smaller geared engine mentioned has a 16-in. cylinder and a 24-in. (2-ft.) stroke and, running at a speed of 125 r.p.m., makes 250 strokes per minute. The area of the cylinder is $0.7854 \times 16^2 =$ say 201 sq.in. Assuming the same mean effective pressure in the cylinder as before, the total average pressure on the piston is $80 \times 201 = 16{,}080$ lb. For a 2-ft. stroke the piston speed is $2 \times 250 = 500$ ft. per minute. The efficiency of a geared engine will be somewhat less than that of a direct-connected engine when operating under the same conditions and may be assumed, in this case, as 80 per cent. The horsepower developed by this geared engine is therefore

$$H = \frac{0.80 \times 16{,}080 \times 500}{33{,}000} = \text{say } 200 \text{ hp.}$$

These calculations show that the two engines have practically the same power. The fact that an engine is geared does not affect its power, except to slightly reduce the efficiency of the engine. No data are given to enable one to determine the speed of winding on the slope, which is stated at 1000 ft. per minute.

Waterproofing Cement Work

I want to ask a question regarding the effect of surface drainage on the concrete floor of a building. The floor is 42 ft. long and 24 ft. wide, and the concrete is 5 in. thick without any reinforcement. Although this floor is sunk 2 ft. below the surface of the ground, no provision is made for drainage. The foundation walls are 8 in. thick, and have no reinforcement.

At the side of the building and 25 ft. distant is a roadway that is being graded 24 in. deep and 25 ft. wide, the excavation being filled in with cinders. I want to ask if the surface drainage would have any effect to lift or break the concrete floor in the building. The concrete is a 1:2:4 mixture of good cement, sand and limestone rock broken to pass through a 1-in. mesh. One pound of waterproofing is added to each concrete mixture.

Staunton, Ill. A. C. G.

The real meaning of this inquiry is not clear. When laying a concrete floor in a basement, or at a lower level than the surface of the ground, provision should always be made for drainage. The concrete should be laid on 10 or 12 in. of well-rammed cinders, beneath which tile drain should be laid to carry off any water that may accumulate.

There is no need of any reinforcement in such a concrete floor. In the case mentioned, there would be no tendency of surface water to lift the concrete, if suitable provision is made against the action of frost. The outer walls of the building should be suitably reinforced. This inquiry, however, suggests the importance of waterproofing all cement work, which is always porous and absorbs water with the result that the concrete is disintegrated and weakened continually by the dissolving action of the water and by frost.

The waterproofing of cement structures has been carefully investigated by engineers, who have found that the most effective method is to impregnate the concrete mixture with oil whereby the absorption of water is prevented and the life of the concrete preserved. The application of gasoline in which from 5 to 10 per cent. of paraffin wax has been dissolved is recommended. The fluid can be applied to a concrete surface by a brush or sprayed over it with a handpump.

EXAMINATION QUESTIONS

Mine Examiners' Examination, Springfield, Ill., 1918

(Selected Questions)

Ques.—What should be the quantity of air at the downcast, to ventilate a mine employing 675 men and 22 mules?

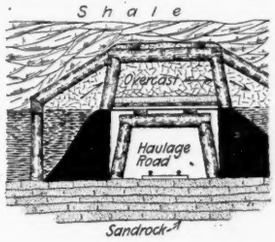
Ans.—Assuming that this mine generates no gas and allowing 100 cu.ft. per minute for each man and 500 cu.ft. per minute for each mule, employed in the mine, the total quantity of air in circulation should be $675 \times 100 + 22 \times 500 = 78{,}500$ cu.ft. per minute.

Ques.—What is a door, stopping, brattice and overcast and what is each used for?

Ans.—A "door," in a mine, is a swinging partition placed in an entry or passageway, to deflect the air current into a crossheading or room. A "stopping" is a solid wall or partition built in a heading, crosscut or other passage to prevent the flow of air through such opening. A "brattice" is a partition built in an airway and consists of boards or canvas nailed to a line of posts set in the passage. Its purpose is to conduct the air current forward to the face and cause it to return on the other side of the brattice. The term "brattice" is sometimes incorrectly applied to a stopping.

An "overcast" is an air bridge built over a haulage road or other passageway, for the purpose of conducting a current of air across such entry or roadway. An overcast built at the mouth of a pair of cross-entries makes it possible to ventilate those entries without the use of a door, which is a particular advantage in the ventilation of a mine.

Ques.—Make a sketch showing how you would construct an overcast. How much air would pass through the same, it being 6 ft. high and 8 ft. wide, and the velocity being 600 ft. per min.?



Ans.—The accompanying figure shows a common form of overcast or air bridge built over a haulage road. Taking the dimensions of the overcast as given, its sectional area is $6 \times 8 = 48$ sq.ft. The velocity of the air current being 600 ft. per min., the volume of air passing is $600 \times 48 = 28{,}800$ cu.ft. per min.

Ques.—Is there a limit to the splitting of the air current?

Ans.—Yes, when an air current is divided too often, the velocity of the air is so reduced that it will not sweep away the gases lodged in the cavities of the roof and other void places in the mines. In order to move these gases, and drive them out of their lodging places, the air current must have the velocity required to effect that purpose. Methane or marsh gas lodged at the face of a pitch or in a cavity of the roof; and carbon dioxide or blackdamp, at the face of a dip, or in a swag or other low place, are difficult to move and require a considerable velocity of the air current.

Under ordinary mining conditions, the velocity of the air passing the working faces should not fall below 4 ft. a sec., and where gas is generated in the mine, the velocity should be from 4 to 6 ft. a sec., depending on the quantity of gas given off at the face. Therefore, in answer to the question asked, the limit to splitting may be said to be reached when the velocity of the air current at the working face in any district falls below the amounts just stated.

Ques.—What is a water gage, anemometer, safety lamp and barometer?

Ans.—A water gage is a device for measuring the difference of pressure between the intake and return airways in mines. It consists of a glass tube bent in the shape of the letter U. Both ends of the tube are open, one end being extended and bent at right angles so that it can be inserted through a hole in the partition dividing the two airways. When in position for use one end of the tube is open to the greater pressure of the intake airway while the other end is open to that of the return air. The difference of pressure, or the pressure causing the circulation inby of the point of observation, is then measured by the difference of the water level in the two tubes. One inch of water column indicates a pressure of 5.2 lb. per sq.ft. of sectional area in the airway.

An anemometer is an instrument used to measure the velocity of the air current in an airway. It consists of a vane having inclined blades so that the passing air rotates the vane. The instrument is so calibrated that one revolution of the vane corresponds to a velocity of 1 ft. per min. of the air current. In use, the instrument is exposed to the air current for one or more minutes, as timed by the watch, and the number of revolutions of the vane is read from the dial on the instrument.

A safety lamp, in mining practice, is a lamp in which the flame is inclosed in a chimney of glass and wire gauze, in such a manner that it is isolated from the outside atmosphere, which is fed into the lamp through gauge-protected openings, while the burnt air and gases pass out through the top of the gauze chimney.

The barometer is an instrument for measuring the atmospheric pressure. The mercurial barometer consists of a glass tube about 3 ft. in length, closed at one end and filled with mercury. When the tube is then inverted and the open end submerged in a vessel of mercury, the mercury column in the tube falls to a height corresponding to the pressure of the atmosphere acting on the surface of the mercury in the vessel below. Since 1 cu.in. of mercury weighs, practically, $\frac{1}{2}$ lb., a mercury column 30 in. in height corresponds to an atmospheric pressure of $30 \times \frac{1}{2} = 15$ lb. per sq. in.

COAL AND COKE NEWS

Harrisburg, Penn.

Anthracite production is falling below last year's output, and it is understood that the Fuel Administration is on the verge of sending one of its headquarters men to the hard coal region to establish an office here and take steps to stimulate mining, if possible. The region will probably be districted, each district to be assigned its quota of hard coal production, honors to be publicly awarded those districts which measure up to the standards fixed. It is learned unofficially that James B. Neale will be sent to the region. His headquarters will be either at Pottsville or Hazleton.

December has not brought the customary suspension of river coal-dredging operations on the Susquehanna and even on the Swatara, the Wiconisco and other streams in the anthracite field which carry down the small coal from the mines. Men and dredges are at work getting out the fine coal which is proving such an important addition to the supply of coal for industries and even for homes. As far down as Middletown dredges are working, and some of the boats will be kept at the harvest until the cold weather makes work on the streams hazardous. There have been more dredges and flats working this year than ever known before.

The Bureau of the Scranton Board of Trade has finally accepted the mine-cave proposal made by the coal companies operating in Scranton and Dunmore, but no agreement has been reached on the appointment of the three commissioners who will have charge of the work to see that the coal companies and the city carry out their part of the mine-cave agreement. The Scranton Surface Protective Association will ignore the mine-cave proposal entered into by the Board of Trade and the coal companies, and devote its energies to securing legislation at the coming session of that body.

Uniontown, Penn.

After having dropped steadily from 750,000 tons for the week ended Oct. 12 to 523,721 tons for the week ended Nov. 23, production of coal in the Connellsville region attained an output of 574,729 tons for the week ended Nov. 30. There is now every indication that influenza has done its worst damage in this region, but several weeks will be required before its effects entirely disappear.

A gratifying increase of 36,242 tons was shown in the shipments of byproduct coal in the weekly review of the fuel administration. Plants have been hard pressed during the last two weeks and have been clamoring insistently for coal. Coke output is placed at 255,127 tons, an increase of 15,177 over that of last week. The byproduct coal shipments for the week were 182,038 tons.

The Fuel Administration has discontinued the practice of commandeering coke tonnage, notice having been received by producers to the effect that they were at once more at liberty to dispose of their product to the best advantage. That phase of fuel administration activities in the Connellsville region since last March has been handled by C. E. Lenhart, district representative. The discontinuance of commandeering of coke will not have any effect upon prices. Neither is it believed will any disturbance in market conditions result. The demand for coke is still marked and is growing stronger. The decrease in production due to influenza and other causes will also react to stiffen the market and further increase the demand.

Charleston, W. Va.

New outbreaks of influenza in various parts of the Fairmont district are restricting the output of coal. There has been and is now no paucity of cars furnished the mines. During most of the week ending Nov. 30 the daily supply of cars averaged in the neighborhood of 1500, and few mines were closed down. Prompt deliveries of empties have also been of material benefit to the mines. The demand for Fairmont coal is far from being moribund.

Steady increases mark the mining operations in the Logan district, the latest report showing a total tonnage of 216,336, which represents 83 per cent. of the full time capacity, the production loss thus being only 17 per cent., 9.36 per cent. of which was due to labor shortage as against 14.60 per cent. for the previous week. The increase amounted to about 8000 tons. Car shortage about doubled, but caused a tonnage loss of only 4275 tons.

Although output in the Kanawha district is from 50,000 to 70,000 tons lower than the record production, still the mines are producing as much coal as could reasonably be expected. Virtually all coal produced has a market, and orders are sufficient to insure continued production at the present or a higher rate. There has been noticeable increase in the demand for Kanawha coal, Kanawha & Michigan mines being zoned out of certain Western territory in which there is a call for their coal. Exporters of coal from the Kanawha district, while experiencing no difficulty in securing orders, are having trouble in securing boats.

As has been the case all along—even during the war—labor leaders in the New River district, or rather a few of them, cause a good deal of unrest among miners which reacts on operations. Aside from that operators of the New River district are satisfied with conditions existing at present and believe prospects for an enlarged business are excellent. A decrease of 13,000 gross tons during the last week of November as compared with the previous week was due to the observance of Thanksgiving. The output for the week ending Nov. 23 was 247,000 gross tons and for the following week 233,193 gross tons.

Production in the Pocahontas and Tug River district is now nearly up to the high point reached during the progress of the war. Latest figures show the output to have jumped from 415,000 to 428,000 tons. More man power is now available. No surplus of the coal mined is accumulating in the Pocahontas region, there being a ready demand for all Pocahontas coal produced. Production of coke amounted to 50,495 tons.

With 24 mines in the Kanawha district not reporting, the total output for the week ending Nov. 30 was 151,764 tons. On its face that would indicate a loss of 6000 tons, but it is believed that if the mines out had reported there would have been an increase. Such tonnage loss as there was due to a labor shortage and to the Thanksgiving holiday, 1299 hours being recorded as the time lost through labor shortage. Cars furnished were sufficient to meet all requirements.

Victoria, B. C.

A blowout of coal and gas occurred recently at No. 1 East Mine, Coal Creek, Crowsnest Pass Collieries, Ltd. All men were withdrawn safely. This incident, taking place with the single-shift system in operation, is taken, by those who have contended that the change would bring no improvement in conditions in respect of safety, as confirmation of their stand. Shortly before the happening mentioned above a fire threatened No. 1 South Mine, Coal Creek. It was confined, however, to a crosscut, being got under control before much damage had been done.

It is reported that coal output for British Columbia during the month of November is expected to show a decline in comparison with that of October, which was 217,482 tons. Both the Canadian Western Fuel Co. and the Canadian Collieries (D), Ltd., the largest producers of Vancouver Island, were seriously hampered by illness in the course of the past thirty-odd days. At one time there were as many as 600 of the employees of the Canadian Collieries away from work for periods of varying length. The same condition prevailed in the Nicola-Princeton and the Crowsnest Pass fields, so that it is felt that the figures which shortly will come to hand cannot be expected to be as satisfactory as hoped for. It is gratifying, however, to be able to report that normal conditions have returned and the collieries are producing at the same average pace as in October and previous months. December, therefore, should see between 200,000 and 250,000 tons of coal produced in the Province.

PENNSYLVANIA

Anthracite

Scranton—What threatened for a while to be a most disastrous fire broke out on Dec. 3 in the carpenter shop of the Mt. Pleasant colliery of the Scranton Coal Co. The structure was leveled to the ground and much of the machinery has been ruined. The shop was situated only a few feet from the boiler house and about 150 feet from the breaker, which for awhile seemed to be in imminent danger of destruction.

Shenandoah—On Nov. 30 a fire which threatened the valuable breaker and other outside buildings, destroyed the large boiler house of the Kehley Run colliery. The buildings were only saved by the heroic work of the volunteers. If the fire had succeeded in reaching the breaker and the other buildings 1200 men and boys would have been thrown idle. The daily production of the colliery is 2000 tons.

Wilkes-Barre—Lehigh Valley Coal Co. monthly employees will get $10 to $20 more under the announcement made of a wage raise to the persons not benefited by the recent agreement with the miners. Other coal companies will also advance their men.

Kingston—Miners employed at the No. 5 mine of the Delaware & Hudson Coal Co., at Larksville, went out on strike Nov. 30. They allege discrimination. About 500 men and boys are affected.

Price Hill—Production at the Price Hill plant of the Price Hill Colliery Co. has been materially increased by the installation of electrical machinery. The main entry has been relayed with heavy steel. A number of new houses have been built and others are under way. H. H. Pinkey is the superintendent at this plant.

Bituminous

Burgettstown—Roberts & Schaefer Co. have been awarded a contract for a Marcus screen to be installed in the new tipple at the Patterson mine of the Burgettstown Coal Co.

Uniontown—Fire of unknown origin destroyed the boiler house of the Brownsville Coal Co. on Nov. 30, causing a loss of $10,000. Forty men at the boiler house were thrown out of employment.

Pittsburgh—The Clinton Block Coal Co. is proceeding with the construction work in connection with a stripping mine at Imperial, and has contracted with the Roberts & Schaefer Co. for the installation of dump house, retarding conveyor, and tipple, which will include a Marcus picking table screen.

Clearfield—Herman Carlotti, a member of the executive board of district No. 2, United Mine Workers, who was appointed to look into the charges of profiteering at Wishaw, Jefferson County, during the epidemic of influenza at that place, has completed his investigation and will lay his findings before the next meeting of the executive committee at Clearfield. It is said that some of the physicians charge the miners as high as $20 for administering the preventive injection to a family of four, and that there are numerous instances of exorbitant charges for services rendered mine workers and their families.

WEST VIRGINIA

Macdonald—Provision has been made by the New River Co., managed by S. A. Scott, for enlarged power facilities. A stone power house is being constructed for its Cranberry plant. The company has also built at its Sprague plant a brick and concrete substation building which will house 2-kw. motor generator sets.

Lorentz—Electrical equipment will be installed by the Florence Coal Co. at its mines here with a view to increasing the tonnage of the plant. The company has erected a large number of houses for miners.

Charleston—The Big Bottom Coal Co., under the management of J. S. Cheyney, has begun to ship coal from its new operation on Campbell's Creek in the Kanawha field.

Cannelton—A shaft mine in the Eagle seam will be operated by the Cannelton Coal and Coke Co., of which F. O. Harris is general manager. The company is now engaged in sinking a shaft.

Coalwood—Construction work on the new Marcus tipple of the Carter Coal Co., at Olga mines, will proceed at an early date. The engineers, Roberts & Schaefer Co., have been given instructions to proceed with the installation of the tipple.

Macdonald—The Meadow Fork Fuel Co. is putting up a number of new houses at its Weeklow plant. The company has purchased and installed new equipment and is opening another drift mine. Operations had been suspended for about ten days owing to the prevalence of influenza. The Meadow Fork company is under the management of J. R. Charlton, of Macdonald.

ILLINOIS

Witt—The two large mines here operating under the receivership of T. C. Keller, of Chicago, have been closed down indefinitely and all tools and other material removed. The cause assigned is no market in which to sell the coal.

Herrin—The Chicago, Wilmington & Franklin Coal Co. is going to increase the daily output of its mine here from 2300 to 3000 tons. Methods to be employed are perfecting the roadway, timbering main haulage and putting in new rail bonds. Two General Electric motors are to be installed and six Jeffrey breast machines.

Johnson City—The Williamson County Coal Co. is making extensions to its plant. Two boilers and one 150-kw. generator have been installed, also two 7½-ton Goodman motors, four Goodman breast machines and 150 mine cars. The company has also built a new concrete machine shop and blacksmith shop combined. The cement gun is being used and is proving satisfactory.

MICHIGAN

Albion—The mine strike at the Albion coal mine is still unsettled at this writing. The men will not return to work until all their demands are met. The operators say they are in no hurry to come to terms. There is little demand for coal.

COLORADO

Pueblo—The Colorado Fuel and Iron Co. has contracted with the Roberts & Schaefer Co. for the installation of a Marcus tipple and rescreening plant, to be installed at the new Crested Butte operations.

Foreign News

Vancouver, B. C.—Replying to the suggestion recently made by the Vancouver city council that the Government should appoint a fuel controller for the province so that such municipalities as wished could license fuel dealers and have some supervision over them, Premier John Oliver has replied that the Government is preparing to name a fuel controller for British Columbia.

Munich—Bavaria is so short of industrial coal, according to latest advices received, that factories are closing daily and all may be compelled to shut down within a few weeks. This would add thousands of men without work to the large number of demobilized troops. The country is also short of food. The coal shortage is due to the French occupation of the Saar district. The entire Bohemian district is closed, and Silesia is unproductive owing to Polish troubles and disturbed transportation caused by the German retreat. There had been an almost rainless season, which rendered the water-power system useless and compelled the use of coal for the generating of electricity.

Victoria, B. C.—Chiefly because of the illness among miners, the dealers in the various cities of British Columbia state that they have not been able to obtain all the coal ordered during November, which has given rise to rumors of a fuel shortage. It just happened that difficulties at the collieries and the heaviest demand of the domestic trade synchronized, which situation is responsible for what uneasiness has been manifested by the general public. The operators point out that there is no danger of a famine and no reason for fear that any households will have to go cold. Coal, however, is retailing now at the highest figure since the exploitation of the Vancouver Island fields. Lump coal brings $10 a ton; nut, $9.75, and slack, $6.50. These prices at a point 80 miles from the mine are considered excessive by the consumers, but the operators and dealers point out that costs have doubled and that these quotations have been authorized by the fuel control department, which is an indication that they are justified by the conditions.

Personals

John R. Porter has been promoted from the position of superintendent of the Macdonald mines of the New River Co., to be assistant to General Manager S. A. Scott.

John Jones, of Plymouth, Penn., has been promoted to the position of superintendent of the mines of the West End Coal Co. Mr. Jones started his mining career as a breaker boy.

R. B. Isner, Elkins, W. Va., connected with the West Virginia Coal and Coke Co., has been appointed district representative of the Fairmont-Clarksburg district, effective Dec. 1, succeeding D. R. Lawson.

W. B. Plank, mining engineer of the United States Bureau of Mines, has been placed in charge of Bureau work in Alabama. He will have his headquarters at the Bureau's station at West End, Birmingham.

Rush Miller, superintendent of mines 36, 47 and 82, of the Consolidation Coal Co., has resigned. He will be succeeded by F. K. Day, who is now assistant production manager of the Fairmont district for the Federal Fuel Administration.

John Whitehead has been appointed superintendent of the Star Coal and Coke Co. at Red Star, W. Va., succeeding **J. M. Black**. Mr. Whitehead, until the present time, has been the superintendent of the Harvey and Prudence mines of the New River Company.

J. K. Mahaffey, who has been representing the Edison Storage Battery Co. in Washington in connection with government business, has been appointed as district sales manager of the Pittsburgh district. Mr. Mahaffey has been in the employ of the Edison Storage Battery Co. since 1916.

L. E. Schumacher, who for the past eight years has been chief inspector of the Westinghouse Electric and Manufacturing Co., at East Pittsburgh, Penn., has been promoted to works manager of the Krantz Manufacturing Co. of Brooklyn, N. Y., the latest subsidiary of the former company.

William Barrack, for a number of years superintendent of the New River-Pocahontas Coal Co.'s operations at Berwind, W. Va., has resigned to accept a similar position as superintendent of the Tidewater and King Coal companies at Vivian, these companies having been taken over, it is understood, by the Houston Collieries.

W. Guy Srodes, of Bellaire, Ohio, has resigned his position as assistant general manager of the George M. Jones interests (comprising the Ohio Collieries Co. in the Hocking Valley district and the Cambria Colliery Co. in eastern Ohio) effective Dec. 15, to accept the position of general superintendent of the Diamond Coal and Coke Co., at Pittsburgh, Penn.

Joseph E. McGowan, of Brooklyn, N. Y., has been elected a member of the Maryland Coal Co. of Maryland, and the Maryland Coal Co. of West Virginia, to succeed the late Howard S. Dickson. Mr. McGowan is secretary and treasurer of these two companies and of the Simpson Creek Coal Co., of which he is also a member of the board of directors, and of the Maryland Clay Products Co.

Bertram Smith, for the past three years district sales manager of the Detroit district of the Edison Storage Battery Co., has been appointed assistant general sales manager, with headquarters at the main office, Orange, N. J. Mr. Smith is known throughout the trade as one of the "old-timers" in the storage-battery business, having been active in the sale of lead batteries for many years before the advent of the alkaline storage batteries.

Obituary

Edwin L. Wade, traffic manager of the Carnegie Coal Co., Pittsburgh, Penn., died on Nov. 21, at his home in Midway, aged 26 years.

Harry Creighton, superintendent of the Maynard coal mines at Rutland, near Gallipolis, Ohio, was accidently killed on Nov. 25. Mr. Creighton was in his 49th year.

Clem Heck, one of the best known coal salesmen in Ohio and the Middle West, died at his home in this city recently from influenza. He spent a large portion of his time during the past year in Columbus and central Ohio, where he represented the M. A. Hanna Company.

A. J. Hill, a pioneer geologist and railway construction engineer of Canada, died on Nov. 26 at New Westminster, B. C. Early in his career Mr. Hill carried out a geological survey of the eastern Cape Breton coalfields, afterward embodied with the plans of the Dominion Geological Survey and published by order of the Government.

Anson S. Pollock, aged 33, well known mining engineer, died at his home in Monongahela City, Penn., on Nov. 9. Death was due to pneumonia following influenza. Mr. Pollock was superintendent for the Union Coal and Coke Co., and for several years had been mining engineer for the Pittsburgh-Buffalo Co. in Pittsburgh. He is survived by his widow and three small children, also by his father, James Pollock, superintendent of mines at Antrim, Penn.; two brothers, A. W. Pollock, manager of mines at Ramaye, W. Va., and James A. Pollock, of Harrisburg, Penn.; and four sisters.

Industrial News

Denver, Colo.—Effective Nov. 15, J. F. Emmert has been appointed sales manager of the Colony Coal Co., with coal mines at Dines, Wyo., and the Colorado and Utah Coal Co., with mines in Routt County, Colorado. Mr. Emmert will maintain offices in the First National Bank Building, Denver.

Toledo, Ohio—While the lake season is not yet over for the year 1918, still it is almost closed and records show a very prosperous season. The Hocking Valley docks loaded 5,132,482 tons up to Nov. 30, and it was estimated that there was about 30,000 tons yet to handle. The docks of that road loaded 4,830,000 tons during the entire season of 1917. The Toledo & Ohio Central docks ceased loading almost a week ago and the records show that 2,178,888 tons were loaded during the season as compared with 2,434,338 tons in 1917.

Philadelphia, Penn.—In order to relieve congestion on the lines of the Philadelphia & Reading Ry., the Government authorities have devised the plan of having that road turn over a heavy tonnage of bituminous coal to the Pennsylvania R.R. at Henderson Station, on the Chester Valley Branch. The Reading carries a heavy bituminous tonnage to tide at New York, but traffic has become so congested over the lines leading to that port that the present arrangement has been devised, the Pennsylvania R.R. turning the coal back to the Reading at Woodbourne, N. J., from which point the regular delivery is made.

Winnipeg, Man.—Four coal companies of Edmonton, Alta.—the Great West, Twin City, Edmonton Collieries and Humberstone Coal Co.—have become associated for the purpose of selling coal in Manitoba. They have incorporated under the name of the Alberta Coal Mines, Ltd., and established a yard in Winnipeg to handle their business. They have lately been shipping ten carloads per week, but are still lacking orders to keep them in full operation.

New York, N. Y.—Deprived of the right to do business by Fuel Administrator Garfield since June 19, the Penn Fuel Co. announced on Dec. 3 that its license had been restored upon the recommendation of the Department of Justice that no case had been found against it. It had been charged that the company had sold coal unsuited for use in the war zone for ships plying between the United States and neutral countries.

New York, N. Y.—In his annual report to the association on Monday, Dec. 9, Arthur F. Rice, Commissioner of the Coal Merchants' Association of New York, says that whatever may be said of other lines of business, the fact remains that Federal supervision of the coal trade has been the best thing that could have happened. The Government found a vital industry largely ignorant of the simplest principles of bookkeeping, and forced it to discover what those principles are; it discouraged unreasoning competition as disastrous to both buyer and the seller; it legislated into existence a "reasonable profit," which in many instances replaced a serious loss; and, by assuming the responsibility of making prices, it removed from the public mind the long existent suspicion that the retail coal business is a well-organized system of piracy. Incidentally, too, Mr. Rice says, it started a few concerns of questionable reputation along the straight and narrow path, by making it unsafe for them to continue in certain practices which had been highly detrimental to the retail dealers. Government control, Mr. Rice says, has given the dealers better business methods, removed public prejudice, and put a premium upon honesty; important changes, which naturally, could not be brought about in a short time without inflicting some inconvenience upon the dealers.

MARKET DEPARTMENT

Weekly Review

Bituminous Production Enough To Take Care of Current Needs—Many Mines Closed Down for Lack of Orders — Shortage of Gas Coals in Evidence—Anthracite Situation Shows Improvement

PRODUCTION of bituminous coal is ample for current requirements. Market conditions are not such as to favor full-time operations at many mines, and in fact the number of mines forced to close down because of no market is growing larger daily. This condition applies to mines in Illinois and other sections of the Middle West. Operators in the Standard field of Illinois are kept working only to satisfy the demand for railroad coal, though even the calls from this quarter are not what they should be. A number of cases are reported of operators in this field who are selling coal practically at the cost of production in order to get rid of their unbilled fuel.

In general, the possibility of any improvement in the bituminous market later on is restricted to special grades and to consumers who had been denied the use of coal while the country was at war. The southern Illinois field hopes for no relief until cold weather sets in, as almost every mine in the region has a surplus of coal on hand. Were it not for the railroad business, many more operations would have to close down on account of no orders.

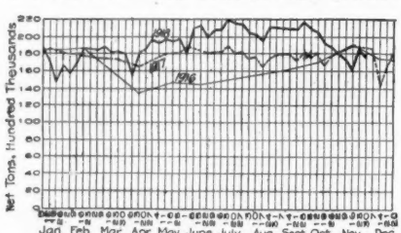
Bituminous steam coals are plentiful. High-volatile coals, on the other hand, have shown such a falling off in production that gas companies which depend largely on this quality of coal are barely able to get enough to keep operating. The railroads, also, are making heavy drafts on these coals, and one of the results is the shortage for malleable iron plants and other industries requiring long-flame coals for special purposes. Several requisitions from Washington in favor of those using gas coals had to be disregarded. In spite of the great surplus of the ordinary steam grades of bituminous, there are plants shutting down for lack of gas coal.

Prices of bituminous are holding up pretty well at Government figures, though reductions are reported in a few quarters. In the endeavor to dispose of some of their stock retailers in St. Louis cut the price from 50c. to 75c. per ton, but the public evinced no great anxiety to buy. The same condition is true of the country generally. Buyers are waiting for a much greater drop in price and are consuming the coal they have accumulated. It is possible that a demand may come later on from buyers who will be anxious to get coals of better quality to use with the inferior fuel now piled in their bins.

Broken and pea make up the bulk of current shipments of anthracite, although egg has come up strongly during the past week, especially at the New York piers. Stove and chestnut, the two sizes most largely used by domestic consumers, are moving heavily on special requisitions through the Fuel Administration, and the lack of these sizes for ordinary distribution is still a great embarrassment to shippers and retailers. It is to be hoped that predictions of an easier supply later will be borne out by increased shipments in January, if not earlier. The fine weather we have been having has helped the domestic situation immeasurably.

WEEKLY COAL PRODUCTION

The improvement in bituminous production which occurred during the week of Nov. 23 failed to continue through the week of Nov. 30, the observance of Thanksgiving Day being the limiting factor. Preliminary estimates place production for the week of Nov. 30 at 9,710,000 net tons, a decrease compared with the week preceding of 1,280,000 net tons, or 11.7 per cent. Compared with the corresponding week of 1917, the decrease during the current week is estimated at 855,000 net tons, or 8 per cent. The average daily production per working day during the week of Nov. 30 (five and a half days), is estimated at 1,765,000 net tons as compared with 1,832,000 net tons during the week preceding and 1,921,000 net tons during Thanksgiving week of last year. The daily average for the coal year to date is estimated at 1,951,000 net tons as against the daily average of a similar period of 1917 of 1,765,000 net tons. The total production for the coal year to date is now estimated at 409,754,000 net tons as against 370,564,000 net tons during the same eight months of 1917.



The observance of Thanksgiving Day on Nov. 28 also caused a decrease of production of anthracite, estimates placing production during the week Nov. 30 at 1,613,000 net tons, as against 1,778,000 net tons during the week of Nov. 23 and as compared with 1,675,000 net tons during the week of Nov. 30, 1917. The daily average per working day during the current week is estimated at 293,000 net tons as compared with 324,000 net tons for the coal year to date and 331,000 net tons during a similar period of last year. For the coal year to date total production is estimated at 66,971,000 net tons and falls below the 1917 production by 1,648,000 net tons, or 2.5 per cent.

Reports from the carriers during the week ended Nov. 30 compared with the week preceding show a decrease in shipments from all districts with the exception of southwest Virginia. Compared with the corresponding week of 1917 the current week's shipments also fell below in all districts with the exception of Cumberland-Piedmont and Somerset, Fairmont and southwest Virginia district. For the coal year to date all districts still continue to report shipments in excess of last year.

Even though the lake season officially closed on Nov. 23, bituminous coal dumped at lower lake ports during the week ended Nov. 30 amounts to 239,891 net tons, bringing the total for the lake season, including vessel fuel, to 29, 289, 903 net tons.

Shipments of bituminous coal to New England during the week Nov. 30 amounting to 359,705 net tons and fell below the week of Nov. 23 by 52,671 net tons, or 13 per cent. Rail receipts through the gateways decreased approximately 10 per cent. and tidewater shipments a like amount. Northern harbors for the week report improvement while shipments from Hampton Roads decreased approximately 20 per cent.

Considerable falling off also occurred in Tidewater shipments during the week of Nov. 30, estimates placing the tonnage loaded at 648,455 net tons as compared with 753,843 net tons during the week preceding, or a decrease of 14 per cent. Baltimore was the lone harbor to report improvement during the week, while shipments from New York and Philadelphia decreased approximately 68,000 net tons, or 17 per cent., and from Hampton Roads, 47,000 net tons, or approximately 15 per cent.

The production of beehive coke in the United States during the week ended Nov. 30 is estimated at 522,000 net tons as compared with 521,000 net tons during the week ended Nov. 23 and 637,000 net tons during the correspondent week of 1917. The daily average during the current week is estimated at 87,000 net tons as compared with 106,000 net tons during the week of Nov. 30 of last year. The production during the past two weeks was the lowest reported since January of this year and is considerably lower than the weekly production of byproduct coke which is now averaging approximately 580,000 net tons per week. The operators in the Connellsville, Greensburg and Latrobe districts of Pennsylvania report production of beehive coke at 291,972 net tons and the operation of their plants at 65.6 per cent. In these districts improvements occurred during the week in labor conditions. The same operators produced 160,500 net tons of coal.

The production of byproduct coke during the week of Nov. 30 is estimated at 572,494 net tons as compared with 574,847 net tons during the week preceding. During the current week the plants of the country were operated at 88 per cent of their full time and during the week preceding at 88.4 per cent. While repairs to plants remained the limiting factor, loss of full time attributed to no market increased during the week from 0.8 per cent to 1.8 per cent., such losses being reported by operators in two states, Massachusetts and Pennsylvania. A decrease in production occurred during the week ended Nov. 30 in Illinois, Indiana, Minnesota, Tennessee and West Virginia. In all states with the exception of Minnesota this decrease is attributed to repairs to plants, while in Minnesota other causes brought about the decline. No market losses in Massachusetts amounted to 37.3 per cent. of full time, and were

but slightly lower than those reported during the week preceding, while in Pennsylvania loss of time attributed to no market was offset by repaired plants. Improvement in operating conditions also occurred during the current week in Kentucky and Maryland. Pennsylvania operators alone now report loss of time on account of shortage of byproduct coal.

BUSINESS OPINIONS

Marshall Field & Co.—Current wholesale distribution of dry goods is running about the same as for the corresponding week of 1917. Road sales for immediate delivery were even while sales for future delivery were not so heavy compared with same week last year. Not quite so many customers were in the house. Retailers report an excellent holiday business. Collections continue good.

American Wool and Cotton Reporter—There is no doubt of a sufficient supply of wool, although the grade may not always be exactly what particular manufacturers may desire. The supply can under no circumstances become less than needed, unless the Government prevents anything like resumption of normal conditions in the raw wool trade. No anxiety is exhibited by the South with the recent decline of the price of cotton. They are not pushing their cotton on the market at all. Southern planters and owners of the staple are holding their cotton until they get what they want.

Bradstreet's—Uncertainty, savored, however, with optimism, accompanied by a manifestly slower gait in actual movements and additional cancellations of war orders, epitimizes trade conditions. Groping for tangible tendencies, speculating as to the course of prices, shifting from war to peace work and year-end stock-taking occupy most attention in the larger lines. Underneath the pause, preparations to send salesmen on the road after the turn of the year are going on. Immediate demand, light as it is, overshadows buying for future account, thus indicating a disposition to await developments while covering current needs.

Dry Goods Economist—The principal activity of the week in retail dry goods and department stores has been centered upon the sale of holiday goods, and of needed cold weather wear. The stores in all principal centers have been thronged with customers, and sales have reached high averages. In view of the large volume of business being done, wholesalers and manufacturers have looked for liberal orders and reorders on goods needed for consumption in the near future. Instead, however, a feeling of conservatism has made itself felt in an unmistakable degree. Heads of departments in retail stores are anxious to dispose of goods purchased at high prices, and are not inclined to increase their holdings, because of a feeling that before additional goods are needed prices may undergo a revision downward.

Atlantic Seaboard

BOSTON

Market extremely dull. Inquiry all-rail confined to a few railroads and special requirements. No demand for steamers. Obscure prospect coastwise for Hampton Road shippers. Quiet market over New York piers. Improved demand for bunker coals. District representatives notified to cancel all requisitions in favor of industrials. Receipts continue to sag. High volatile grades again in short supply. Possibility of improved market later is restricted to requirements not able to stock during early fall, or those desiring better grades. Anthracite receipts fall off slightly. Shortage of stove and chestnut continues. Criticism of New England Fuel Administration for method of financing "free coal." Rumor that anthracite section will cease functioning during January. Mr. Storrow refuses Boston City Council demand for data as to retail profits.

Bituminous—The first week of the absence of local regulation was almost colorless. Except for a few forced sales of water-borne coal at rehandling points there have been no developments as to price and the market continues extremely dull. Empty coal cars are still accumulating and very light movement is the rule. Reserve supplies are far beyond normal and there is every inducement to use up the coal on hand before making further purchases. Not only is it higher in price than buyers expect to pay next season, but its nondescript character, in most instances, and the prospect if not the actual presence of fire in storage piles are important considerations in the fuel department of practically every industry in this territory. There is almost no spot market either all-rail or by water, and that shipper is fortunate who is still able to get shipments accepted even when in fulfillment of contract.

All-rail inquiry is confined closely to certain of the railroads, and to special requirements where arrangements were not made earlier. All the railroads are carrying liberal reserve stocks, but apparently on the part of some there is still a disposition to take rail coal at the present fixed price for a while longer rather than pick up coal from storage. A lot of the fuel in stock was accumulated on high prices from steamers where demurrage charges had accrued, and almost it would be supposed that such reserves would be worked off rather than to have purchases made under present conditions. On the other hand, rail coal cannot be had, even today, just for the asking. Influenza is still a factor in the region and there are enough local differences over the wage scale, etc., to make more than a few operators decline even the meager orders now being offered them. The railroads nearer the mines are also taking coal in greater quantities and the decreased volume to New England is not wholly due to lack of market.

Inquiry for coal over the New York piers is equally dull. Even coals from Pools 10 and 11 are not an easy sale for shipment along the Sound. Pool 10 was recently included among the grades suitable for bunkering purposes and it is expected that increased sailings overseas from New York will stimulate demand for the better coals. While just at this time there are very few ships to bunker, and the market is dull in consequence, the trade is confident this will improve. Indeed there are signs of this already, and when output is more nearly on a normal basis a much heavier movement to the piers will be looked for.

The Greensburg district, as well as other regions where the high volatile grades originate, has shown such a notable falling off in production that New England gas companies, for instance, are barely able to get supply enough for current operation. The railroads, also, are making heavy drafts on the current output of these coals and one of the results is the shortage for malleable iron plants and others requiring long flame coals for special purposes. Several requisitions from Washington in favor of industries of this kind have had to be disregarded, and today, in this territory, in spite of the great surplus in every direction of ordinary steam grades there are plants shutting down for lack of gas coal.

In general, therefore, the possibility of any improved market later is restricted to special grades and for requirements where there was less opportunity during August and September to accumulate coal. It is possible that there will also be inquiry later from buyers who will be anxious to get the coals of better quality to help use the inferior fuel that is now piled high in their bins.

Anthracite—The movement of domestic sizes through the gateways has again fallen off slightly. The daily average for November was 333 cars, but the first few days of December saw this figure reduced to only a little over 300 cars. Broken and pea still make up the bulk of current shipments, both water and rail, although egg has come up strongly the last few days, particularly at the New York piers. Stove and chestnut are moving heavily on special requisitions through the Fuel Administration and the lack of them for ordinary distribution is still a great embarrassment to shippers and retailers. As between different communities there has been great inequality of distribution if the two sizes most largely used, and it is to be hoped that predictions of an easier supply later will be borne out by increased shipments in January, if not earlier.

Mr. Storrow is being commended for his strong stand in answer to the demand of a committee of the Boston City Council for complete data with respect to the net profit of each Boston retail dealer on each ton sold. Mr. Storrow refused to give such information, on the ground that if it came to him it would be received by him as a Federal officer and one in no wise subject to the direction of the Boston City Cohncil. The fact that Mr. Storrow is a member of the Boston City Council lent some spice to the controversy.

NEW YORK

Demand for anthracite stove and chestnut continues to absorb shipments. Pea and the smaller coals plentiful. Shipments to this market far below requirements. Production hindered by lack of labor. Bituminous in good demand. Commercial coal supplies kept down by bunker requirements.

Anthracite—Increased receipts for the local trade and the continuation of favorable weather have put the anthracite market on a better footing. Dealers have not been urged to make deliveries and they have had a reasonable breathing spell. At the same time consumers have been permitted to go into the middle of December without scarcely touching their winter supply. While there are many who believe there is going to be a lack of domestic coals here all winter, those who are in a position to know do not expect any such conditions as existed last winter to arise this season. They do not look for any surplus of egg, stove or chestnut, but on the other hand do not look for any extreme shortage of these sizes.

With the demand in the Northwest taken care of and the shipments to these points practically stopped, more coal should come to eastern points.

In keeping with the past few weeks the cry is for egg, stove and chestnut sizes, but it appears there is less of these coals in the dealers' yards than for many months back. Broken and pea are in better supply, but the latter, which was plentiful a few weeks ago, is tightening. Consumers who are short of their usual quantity of the larger coals are being induced to take to burning pea, with the result that it is scarcer.

So far New York, with the exception of a few days, has not felt the effects of the winter and consequently comparatively little of its winter supplr of coal has been burned. Nearly every householder has plenty of coal on hand to last him for several weeks, and meantime, with western shipments curtailed and the situation in other sections of the country back from the seaboard in good shape, shipments to tidewater which were neglected earlier in the season will be increased and more coal will be rushed into this market.

State Fuel Administrator Cooke has announced some slight changes in the allotments of anthracite to various towns throughout the state, and has placed embargoes on shipments to numerous places.

The demand for No. 1 buckwheat has caused a tightening in that size and has caused a shortage in supply. Two of the selling agencies have announced an advance of 40c. per ton in their price for this size and a similar advance has been made by some individuals. So far no change in prices has been forthcoming from the large producers. No change in prices as to rice and barley have been announced, which sizes remain plentiful.

With encouraging reports from certain sections of the coal fields, showing better production, the dumpings at the local docks for the week ending Dec. 6 amounted to 6127 cars, as compared with 4869 cars the previous week.

In the northern coal fields producers report that influenza seems to have taken a fresh hold, and many new cases have been reported. In the southern fields conditions are slightly better.

Current quotations, per gross tons, f.o.b., Tidewater, at the lower ports are as follows:

	Circular	Individual		Circular	Individual
Broken	$7.80	$8.55	Buck	$5.10	$5.90
Egg	7.70	8.45	Rice	4.65	5.10
Stove	7.95	8.70	Barley	4.15	4.30
Chestnut	8.05	8.80	Boiler	4.60	
Pea	6.55	7.30			

Quotations for domestic coals at the upper ports are generally 5c. higher on account of the difference in freight rates. Prices for buckwheat, rice, barley and boiler are not fixed by the Government.

Bituminous—The general situation here shows a slight improvement. Commercial coals are not so much in evidence, due in a great measure to the inclusion of Pools 4 and 10 into the bunker class.

Production figures are showing a steady increase, with a corresponding falling off in demand by large consumers. Shipments to this port for the week ending Nov. 16, while showing a decrease of 184 cars from the figures of the preceding week, were sufficient to take care of current requirements inasmuch as the demand from New England water points has nearly ended for the season. This week will practically see the end of shipments of so-called "Storrow" coal from this port, and it is expected that all accounts for this coal will be closed within a few weeks.

There was an improvement shown in the local dumpings for the week ending Dec. 6, when 6450 cars were handled as against 6127 cars the previous week, an increase of 323 cars.

With the cancellation by the Fuel Administration of all requisitions for bituminous coal to industrial plants such industries will now be forced into the market for their supply, and shippers will have a better opportunity to dispose of their surplus as they see fit. This demand will not, however, be the means of forcing

a cut in prices unless weather conditions are such as to keep down consumption and thus create a long market. Producers do not anticipate any such conditions with the winter just starting, and a labor shortage.

The anticipated removal of price restrictions on bituminous which was to have become effective Dec. 15 is not expected to materialize. It was said among the trade that the latest information was that the Fuel Administration wiuld continue to have supervision over the industry until Apr. 1 at least, and that there would be no changes in prices. This was welcome news to many of the trade, who believe that the removal of restrictions at this time would not be beneficial.

Current quotations, based in Government prices at the mines, net ton f.o.b., tidewater at the lower ports, are as follows:

	Mine Gross	F.o.b. N. Y. Gross
Central Pennsylvania:		
Mine-Run, prepared or slack	$3.30	$5.45
Upper Potomac, Cumberland, and Piedmont Fields:		
Run-of Mine	3.08	5.23
Prepared	3.36	5.51
Slack	2.80	4.95

Quotations at the upper ports are 5c. higher.

PHILADELPHIA

Anthracite conditions unsatisfactory. Conflicting instructions annoy. No delivery of entire orders prior to Jan. 1. Stove and nut still short, but improvement shown. Dealers' needs overstated? Speculating on future trade. Some salesmen out. Labor situation improved. Steam demand fair. Bituminous firmer. Good coals in strong demand. Tide business active.

Anthracite—Another week of most unsatisfactory business conditions in both branches of the trade is to be recorded. There are many cases where the relationship between the shipper and retailer is becoming strained, to put it mildly. The officials of the state and city fuel administrations are showing unmistakable signs of tiring of their positions, and it is understood there has been much friction of late with various interests. The sales agents in their efforts to pacify disgruntled buyers show a strong inclination to criticize the distribution.

Stove and chestnut are as scarce as ever, and the demand for these sizes increase each day. The largest shipping company is now making substantial daily consignments here, but as this trade has been almost neglected for six weeks it will be some time before any great improvement will show in the general condition. After unusual efforts and much pressure from their trade another company has just arranged to make up some of its deficiency in tonnage. The suburban dealers in the extreme northwestern section of the city have been the greatest sufferers, but they will undoubtedly receive attention this week. The trade in Germantown and Chestnut Hill, where the homes are much larger and the required tonnage much heavier, is also in urgent need and we expect soon to see some concerted action from them.

Notwithstanding the cry for coal from all directions it is apparent the opinion is growing that the trade will not require the heavy consignments they now claim are necessary. The unusually mild weather of fall and early winter saved thousands of tons and helped in the economy of coal that all consumers seem to be practicing.

We frequently hear the prospects of spring business discussed, for there are some in the trade who predict the present market will collapse in March. Yet there are others who state that the people have had it drilled into them so thoroughly to buy early, that those with the money will surely continue the practice of taking in their coal supply as soon as they can get it.

In speaking of the spring business, much conjecture is expressed as to the prices, and there are some who predict that the public will not buy coal next spring for the following winter's consumption, if only the usual reduction from the present high rates is offered. While such talk may be premature, it shows that both the shippers and the larger dealers are already looking ahead. As a matter of fact quite a few of the companies are now sending their salesmen out on the street. This is not because they have any coal to offer, but inasmuch as some of the former office workers are being released from the army, these concerns are taking advantage of the opportunity to let their salesmen go over their territories to get in closer touch with conditions, with future business in view.

Judging from the fact that during the recent scarcity of coal a number of dealers laid off help, we are inclined to believe the labor situation is much easier. Some months ago, whether yards were bare of coal or not, no retailer was willing to risk losing a yard man or driver by suspending him. In fact we know many who paid full wages when men failed to report for work for a day or two.

Pea coal seems to be fairly easy in most sections, but the dealers expect their rather small stocks to disappear with the first snow. As one dealer expresses it, his pea coal buyers are never heard from until the snow flies.

In the steam trade buckwheat is fairly strong, and rice is causing little concern. Barley is in bad shape and a great deal of it is being sent into the storage yards, while culm is practically unsalable.

Judging from the way all dealers pay their bills the retailers cannot be in the desperate shape they would like their shippers to believe. It would appear that the business was now on at least a 75 per cent. cash basis, and the advantages of this plan are so apparent that no one wants to go back to the old system of long credits and cut prices.

The agitation as to the retail prices has about subsided, and the public seem to have taken in good faith the statement of the fuel officials in regard to the reasons for the increase. Privately the dealers still feel they should be allowed some extra compensation, but this seems unlikely and it is believed the fuel administration will endeavor to hold them off until spring and then the market prices will be in effect with the retirement of the administration.

The prices per gross ton c.o.d. cars at mines for line shipment and f.o.b. Port Richmond for tide are as follows:

	Line	Tide		Line	Tide
Broken	$4.90	$6.25	Buckwheat	$3.40	$4.45
Egg	4.80	6.15	Rice	2.90	3.80
Stove	5.05	6.40	Boiler	2.70	3.70
Nut	5.15	6.50	Barley	2.40	3.30
Pea	3.75	5.00	Culm	1.25	2.15

Bituminous—The market has grown appreciably stronger, particularly in high-volatile coals. There is an active demand for about all the coal that reaches here. The wagon-mine operators are still handicapped by the lack of box-car equipment. At Tide the demand for coal continues most active. It is generally agreed that the market is assuming a better tone, but there are some consumers who are actually refusing coal. These are the very large plants, many of which have been on Government work, and during the transition to normal activities they are cutting down their coal receipts, owing to heavy stocks already held by them.

There is a constant rumor that the fuel administration will relinquish all control of the bituminous situation by the first of the year. While no one anticipates any particular unsettling of trade, there is quite a good deal of speculation as to what the market will settle down to as to prices.

BALTIMORE

Bituminous situation remains easy, with demand comparatively light. More and more offers of fuel. Hard coal situation unsatisfactory and local fuel administration officials appeal for popular sizes.

Bituminous—Supplies of bituminous here seem to be adequate for the time being, and, as business firms have been taught not to stock up for months in advance, the demand that comes forward is apparently not urgent in most cases, industries being content to replenish when stocks run down. Purchasers are growing a little more discriminating, but this is met by the fact that a better grade of coal is also running, even though best fuels still remain under Government direction. Considerable quantities of good gas coal are now coming through, also, in connection with pier loadings. In a very short time also it is expected that a big jump will be noted in export movement of coal, and the trade as a whole is expecting that this will prove one means of preventing any big drop in price under competition.

Anthracite—The Maryland Fuel Administrator and members of his Baltimore City Committee have made an appeal by personal visit to the anthracite distributing committee in Philadelphia for relief of the situation in Baltimore. Not only is the total movement claimed to be below needs, but the fact that stove and nut sizes are not often included in the tonnage to a city that is made up in unusual amount of small homes is causing worry. Egg coal is not much used in many homes here that are now without coal. The zone rule against Sunbury was lifted and some stove coal of that quality has come through, but not enough to affect the general situation. This coal has always retailed here at 25c. above the schedule for white ash, and while the local administration has not allowed it placed on the formal schedule the majority of dealers here, to receive any Sunbury, are selling at the old advance over circular price for white ash. It is claimed that breakage makes this necessary.

Lake Markets

PITTSBURGH

Production increasing slowly. Market still firm for standard grades.

Coal production in the Pittsburgh district is increasing, but only very slowly. The influenza has been on the wane, so far as concerns news cases, but men are a long time returning to work and operators are encouraging them to make sure they are entirely recovered before they resume work. Car supply has improved and is almost entirely satisfactory.

Under instructions from the Federal Fuel Administration the local distributor is now taking care only of railroads and public utilities generally, ordinary private consumers being left to shift for themselves. This reduces the distribution control to about 45 per cent. of the total.

Consumers are showing no disposition to stock coal, even if afforded the opportunity, except the byproduct coke producers, and they will stock only their favorite grades, which are still difficult to secure. Much byproduct coke is being made with less admixture of Connellsville coal than is desired.

The Pittsburgh district coal market shows no signs of weakness as regards standard grades, and operators insist that the market is going to hold when price control is taken off. While there were intimations that the control would be taken off about Dec. 15, it is now far from certain that this will be done, by reason of the curtailment in output that has occurred. Wagon mines are still operating, but their production is off somewhat and it is doubtful whether many will operate clear through the winter. The market is quotable at Government limits as formerly, but brokers can rarely secure a commission from buyers in addition, Government prices being: Slack, $2.10; mine-run, $2.35; slack, $2.70; per net ton at mine, Pittsburgh district.

TORONTO

Shipments of anthracite light. Only grate and buckwheat procurable. Bituminous market quiet, owing to closing of munition plants. Labor shortage relieved. Fuel controller urges use of substitutes for hard coal.

Receipts of anthracite continue light and are practically confined to grate and buckwheat, local deliveries being restricted to these grades. With the closing down of many munition plants the general labor shortage has been greatly relieved, and coal dealers have now all the labor they need. The market for bituminous continues very quiet, owing to the lessened industrial demand, and dealers do not anticipate any change for the better until the munition manufacturers have reverted to, or engaged in, other branches of production, as most of them are preparing to do.

R. Home Smith, Provincial Fuel Controller, has issued another warning to the public, pointing out that the Province will be faced with a serious shortage before spring, as the cut in the supply will be considerably more than the 20 per cent. reduction in the allotment made by the United States Fuel Administration. In the distribution domestic users will be given the preference. Bituminous coal and wood must be substituted for anthracite in all buildings having furnaces in which they can be used, and owners of office buildings, apartment houses, warehouses and factories are required to sell their anthracite on hand and divert shipments not already received.

BUFFALO

Asking what the throwing off of restrictions will do for the bituminous trade, opinions differ. Trade dull. No anthracite increase. All going to lakes yet.

The surplus here of bituminous coal is still reported to be as large as ever, so that if production has suffered considerably the consumer is not disturbed by it. The general idea is that not only will the thin-vein Allegheny Valley coal lose its extra price, but that all other bituminous will have to come down also, for there is a large amount of Ohio coal to be disposed of in this market. It is not yet allowed to go east of Buffalo, but will soon

go free again. This market knows the coal and is ready to handle it once more.

Buffalo has suffered severely from the late shortage, as it did not control enough coal to meet the needs of the shippers here. Now, however, the conditions are changed and more coal is to be had than can be sold. On this account the jobbers are coming back to business again, though they find it poor.

Anthracite—The clamor for coal increases as the weather grows colder. From the reports one would think that nobody had any. Some of the distributors have the idea that the supply that has come in lately has not kept up with the consumption. The weather has done well by the trade of late, as not in a long time has there been so warm a fall. The best that the distributors can do now is to meet the most urgent cases till the supply increases after the lakes close.

CLEVELAND

Demand for No. 8 coal to mix with lower-grade fuel has come in surprising volume from consuming districts heretofore denied No. 8 coal under the zone system. This has offset to a great extent an otherwise narrowing market. Production again is severely feeling effects of influenza.

Bituminous—With zone barriers gradualy being broken down and the outlet for No. 8 coal broadened, a surprising demand has arisen in districts amply stocked with coal from other producing sections. Especially is this true of Michigan, which has absorbed a considerable amount of Indiana and Illinois coal. Regular No. 8 buyers intend mixing their preferred supplies with the coal forced upon them by the zoning system. This outlet has come just at the time steam-coal consumers in northern Ohio have entirely left the market and the lake season has practically come to an end.

Accordingly, with production badly off on account of influenza, demand for standard No. 8 coal is keeping right on the heels of the supply, and prices have held surprisingly firm. On this point operators and the local fuel administration officials are agreed. Very little regular No. 8 coal can be purchased below the Government prices, it is asserted, though stripping coal can be had at virtually the buyer's price. Concessions of 70c. on this coal to $1 are of frequent occurrence, but the takers are few. The railroads are again evidencing a desire to obtain a general reduction in the price of their fuel, but operators are not disposed to accommodate them.

Requests for cancellations of contracts have been more numerous. In the majority of cases they have been refused. Where an operator could divert the coal and the interest seeking cancellation is a friend, it has been done. But outside of contracts, practically no coal is moving into northern Ohio plants. This is more because of a desire to deplete stockpiles than a depression in production. The change from a war to a peace footing is being made quite painlessly in this district, due mainly to the large automobile and automobile parts industries, and the turn of the year undoubtedly will find steam coal again moving in fair volume. Recurrence of cold weather has stimulated domestic demand somewhat. Much coal is believed being lost in stockpile fires.

Anthracite — Receipts have increased slightly, while 2500 tons held by a factory in Cleveland for Government war work have been released. This has thrown more anthracite on the market, but it is not a drop in the bucket compared with what could be disposed of.

Lake Trade—Five cargoes of bituminous for Milwaukee have been loaded at Lake Erie ports and these, it is believed, will wind up the Great Lakes bituminous season. Anthracite will be loaded at Buffalo so long as the carriers are operated. The rate from Buffalo to Lake Michigan has been advanced to $1.

DETROIT

Steam plants and retail dealers, with an oversupply of coal, present a serious hindrance to normal business in bituminous. Anthracite continues short in supply.

Bituminous—Too much bituminous coal in yards of retail dealers and in the stockpiles of steam plants in and around Detroit is reflected in a greatly reduced volume of business for wholesalers and jobbers in the Detroit market. Both classes of buyers apparently took alarm at the predictions of impending coal shortage that were circulated a few weeks ago. Their efforts to guard against shortage seem to have produced an indiscriminate scramble for stock, in many cases, with the result that buyers took anything and everything offered.

Because of this haste, the retailers now find their yards congested with bituminous coal, much of which is mine-run and other forms of stock that the household consumers object to taking; while the steam plants are experiencing annoyance with coal of an inferior quality that was bought to fill out reserves when the more desirable stock from West Virginia and Ohio mines was withheld by the Fuel Administration's modified zone regulations.

Some of the retailers are endeavoring to dispose of excess stocks through sale to departments of the municipal government. The municipal purchasing agent informs them, however, that the price at which they offer coal to the city is about $1 a ton higher than he can buy bituminous coal elsewhere. There is said to be a possibility of the dealers being asked to submit bids for part of the city's supply.

Lake Trade—Shippers in Buffalo are still loading anthracite for movement up the lakes, and within the last few days have succeeded in chartering a dozen or more vessels. The carrying charge on coal from Buffalo to Milwaukee has been raised to $1 a ton, whil $1.15 a ton has been offered on cargoes to be taken from Buffalo to the head of Lake Superior.

COLUMBUS

The coal trade in Ohio is still rather weak, especially in the steam grades. Domestic business is slow because of unfavorable weather conditions. Producing and shipping interests are playing a waiting game.

The coal industry in Ohio is still rather quiet in all respects. There is a plentiful supply of all grades, but more especially mine-run and screenings. The demand is curtailed by the stoppage of hostilities and also because of the continued warm weather, which has not stimulated the domestic trade. The tone of the trade is not good and coal men are at a loss to judge the future. But it is generally conceded that there will be a better demand for all grades after the first of the year.

The steam trade is quiet to the extreme. Buying on the part of steam users is at a minimum because of rather large stocks in reserve and also because of uncertainty in the future. The Michigan market is closed temporarily because of the reserves of Indiana and Illinois coal. Steam users generally are loath to increase stocks under present conditions and are following the policy of using up what they have on hand. Railroads are very slow in taking tonnage and that has been one of the big departments of the trade for some time. The readjustment program is not yet mapped out and uncertainty pervades the market on all sides.

Domestic trade is slow, as retailers have ample stocks for the present. They have not yet been favored by cold weather and consequently have not been able to move any stocks. There is some demand for the so-called fancy grades, but dealers have little available storage space. Domestic prices are still firm at Government levels as it is realized that any reduction will not stimulate trade under present conditions. The differential between thick and thin vein Hocking has disappeared. Pocahontas is not yet on the market, but some is expected soon. New River and splints are coming in to a certain extent. The change in zones is expected to bring all former varieties that sold in Ohio.

Production has been reduced because of a lull in the demand and also because of the prevalence of the influenza epidemic. The output in the eastern Ohio field shows a reduction to about 40 per cent. of normal. In the Hocking Valley and Pomeroy Bend the output is about 40 per cent. and possibly less. Crooksville and Cambridge fields show up with about the same percentage.

CINCINNATI

The market is quiet, uncertainty regarding industrial prospects hampering demand. Supplies on hand are better than usual.

The process of changing from a war to a peace basis is proving so complicated, as far as the numerous industries in this section are concerned, that it has produced almost a complete standstill in some lines, and is affecting others hardly less. The cessation of manufacturing for war purposes has of course been complete, and while the Government may make adjustments to prevent losses among concerns which had contracts for the production of supplies, the supplies themselves will not be made except in a few instances. The result is that as peace business has not yet had time to make itself felt in the shape of definite orders, and as many plants must undergo some changes in order to turn them back to ordinary business, there is a considerable degree of industrial idleness, which is being reflected in an unusually small demand for fuel, considering the season. For the same reason, manufacturers are reluctant to commit themselves to contracts for fuel as long as they are uncertain as to what their requirements are going to be, and this uncertainty will persist until a change in the industrial situation has time to take place. The extent to which fuel has been stored by consumers of all classes has also undoubtedly had a strong influence on the situation, as domestic consumers are taken care of by storage to an unprecedented extent, while many manufacturers, who expected to operate on a war basis all winter, made correspondingly large preparations for the fuel supplies, including special provisions for yard storage. Production is not on a large scale, as operators see no reason to push things under the circumstances.

LOUISVILLE

Some small demand for better grades of domestic. Steam generally dull, with screenings in better demand than mine-run. Considerable effort shown to cancel contracts.

Reports from producers, jobbers and retailers this week are generally unsatisfactory. The market is weak, and the unscrupulous small operators, jobbers and retailers are cutting prices considerably under the Government price quotations. Many of them are virtually forced to do so in order to keep going. With no demand to speak of for better grade coals, and low grade coals not wanted, the situation is serious. Many retailers have heavy holdings of low grade coals, mine-run, etc., which were purchased on the strength of efforts made by the Fuel Administration, and in some cases these coals are expected to be hard to sell at anything like a fair price, considering the fact that prices are being cut on the low grades, and some of the retailers with high priced low grade coals on hand will have to sell at much lower than expected figures.

As a result of a smaller demand for coal in the Pittsburgh field, West Virginia and Pittsburgh bituminous coals are moving into the Cincinnati and Kentucky districts more freely; and indications are that a good boating stage will bring out a lot of river coal. However, the markets as far south as Cairo are well taken care of, excepting a few river towns which depend on river coal. However, if the packages and tows can be secured, there may be a fair southern market for it. However, western Kentucky is paying more and more attention to river shipments to the South, but is short of barges and boats to handle it. It is reported that some high-grade West Virginia coal has been moving into the Cincinnati market, and selling at prices under some of the eastern Kentucky coals during the week, this showing how hard set the big companies are for business.

Cancellations have been coming rapidly, and many operators have received numerous hold orders. However, on most of these hold orders, if not claused in the contracts, operators are going right ahead and shipping, and if necessary expect to go into the courts to hold the contract makers, who are using numerous methods of getting out. One of the chief methods is to declare the coal to be of a grade under that purchased, and due to the fact that fast mining methods have reduced quality, it will in many cases be a hard matter for the operator to prove that the coal isn't under grade.

BIRMINGHAM

Inquiry for steam coal much improved, and buyers active. Domestic demand still strong. Receipts of both grades inadequate to meet requirements. Influenza again prevalent and badly crippling production.

Improvement in the demand for steam coal in this market has been very marked during the past week, and consumers have been active in an effort to purchase the needed fuel. Furnace companies, oil mills and other large users have been buying up all the free coal available, while the railroads have been endeavoring to accumulate some surplus for the approaching holidays, some lines being short on current requirements. The activity in the trade is attributable to some extent to the desire to stock coal to tide over the idle period around Christmas, but brokers and sales managers are of the opinion that there will be a satisfactory demand for coal at least through the winter months. At present there is no accumulation of coal in this district and it appears that normal production will not be reached again in the near future.

Domestic consumers are buying freely—that is, as freely as the receipts will permit. Much more coal is needed by dealers than they are able to obtain. The stocks on hand are very small and any number of yards depend entirely on shipments received periodically, the coal being sent out direct from the car to the customer.

Coke

CONNELLSVILLE

Coke production increasing slowly. Furnaces less insistent for deliveries. Discussion of contracts for next year. Inspection system established. Less screening of old dumps. Market still firm.

Coke production in the Connellsville region is increasing slowly. Since the termination of the war men have shown less disposition to work and operators are not urging them. Influenza is on the wane, but men are expected to be fully recovered before they resume work. The shortage of coke has resulted in a few furnaces being banked in the past three weeks and others slowing down, but the blast furnaces are making no very strenuous efforts to secure full supplies of coke and operators are probably taking their cue that market prospects will be helped by curtailed operations.

There is practically a deadlock between coke producers and the furnacemen as to contracts for 1919. Some contracts were put through before the end of the war, the terms of which are not definitely known. Sellers claim that the contracts provide that in case of discontinuance of Government prices the last Government price shall rule, while buyers claim the contracts call for settlement, in that event, at open market prices ruling. Each party endeavors to give the impression that the bulk of the contracting has been done, on the terms he mentions, obviously with the idea of inducing the making of other contracts on those terms.

Furnacemen who have been much annoyed at the quality of coke they have been receiving during the war have caused the institution of a new system whereby there will be inspectors at ovens, representing the buyer, who will pass upon all coke before it is shipped. The furnaces are anxious for improved quality first and a lower market next, but are not particularly anxious to see a lower market at once, as that would have an unfavorable sentimental influence upon pig iron prices, which the furnaces wish to maintain as long as possible after Government control formally disappears Dec. 31. There are no market offerings to speak of, except limited quantities of foundry coke, and the market is quotable steady at the Government limits; Furnace, $6; foundry, 72-hour selected, $7; crushed, over 3-in., $7.30, per net ton at ovens. Demand for screenings from old dumps, which were limited to $5.50 for sizes over ¾-in., has become very small, and some cut prices have been made, but contractors generally are disposed to quiet the business rather than make any large concession.

The "Courier" reports coke production in the Connellsville and Lower Connellsville region in the week ended Nov. 30 at 256,715 tons, an increase of 14,610 tons, and raw coal shipments at 192,038 tons, an increase of 26,242 tons.

Buffalo—Scarcity of men in the coke districts has stiffened the market for high grades, so that the furnaces are finding it hard to get what they need. Buffalo furnaces that depend on byproduct coke have had to go into the open market for a great part of their stock. The supply ought to increase soon, but at present the demand for foundry and furnace grades is such that the prices would double but for the Government restriction. Fuel coke is easy where it has to compete with bituminous, but very strong if it has to do with anthracite substitution. Iron ore by lake is about all in for the season, the amount received for the week being only 99,688 tons.

Middle Western

GENERAL REVIEW

News that Fuel Administration is to relinquish all control of soft coal causes consternation. Little change booked for in market conditions before Jan. 1.

The latest information from Washington indicates that there has been an increase of 12 per cent. over the tonnage produced for the week previous. This, in a way, is hard to understand, because operators and sales agents both are having great difficulty in moving the coal produced for the present market, which is very weak.

Mr. Garfield's interview with the press on Saturday afternoon, in which interview he stated that he had under advisement a plan for abolishing all zones and restrictions on bituminous coal, as well as all price regulations, has caused a furore in the Mid-West market. If Mr. Garfield should take the steps which he is considering, it would lead to the greatest confusion and disorganization throughout this whole district.

The first thing to happen would be that operators with mines in West Virginia and southeastern Kentucky, would immediately get a lot of Chicago business, as there has always been a considerable tonnage of Eastern coal used in this city, but as soon as the war began, these firms were forced to use Illinois and Indiana products. If Eastern coal comes into the market, it will, of course, drive out coal produced in our own territory, and will tend to depress the market still further.

Rumors continue to come into Chicago to the effect that large storage piles, scattered throughout Michigan, Illinois, Indiana, Wisconsin and Iowa, are being consumed with reasonable rapidity, and that two or three weeks' cold weather will mark a great reduction in these storage piles. This, of course, is encouraging, because as soon as the average factory has used up some of its surplus, it will once more come into the market for further purchases.

CHICAGO

Steam coal market is weak and domestic demand is nil. Not much change in anthracite. Plenty of hard coal in dealers' bins, but red tape holds up deliveries.

The steam coal market in this city is weak, and conditions do not differ to any material extent from the general situation throughout the Middle West. Coal is to be had at a decided discount, and, as has been the case right through the season, the only coals that have been strong at Government price current at time of shipment are the high-grade fuels from the Indiana fourth vein district and parts of the southern Illinois field.

The domestic trade continues to be stagnant; this in spite of the fact that we have had, within the last week or so, some reasonably cold weather. It is a common sight, on a cold morning, to see regular processions of coal wagons leaving the retailers' yards, and it is a curious thing to note that the retailer has not come in the market to buy coal to replace the coal sold. The reason is perhaps that he is waiting to see whether the zones will really be lifted, in order that, if this proves to be the case, he will be in a position to fill his bins with high-grade Eastern fuels.

The anthracite situation is not much changed. The dealers apparently have plenty of anthracite in their bins, but are prohibited from delivering it by a mass of rules and regulations promulgated by the State Fuel Administration.

MILWAUKEE

Coal market unusually tranquil for the season. Shortage of anthracite the main feature. Stocks of bituminous heavier than last year.

An announcement by State Fuel Administrator Fitzgerald that the amount of anthracite needed to make up the allotment of Wisconsin and other Northwestern states is ready for shipment, has served to encourage dealers who have not as yet been able to get the 80 per cent. of their normal supply allowed by the fuel administration. Those who have received their share have been shut off from anthracite supplies since Dec. 1. However, there are only a few days of lake navigation left, and it may be that cold weather will halt the coal on its way up the lakes. It is understood that five vessels, whose capacity aggregates about 40,000 tons, have been chartered to bring this late supply of coal to market, at a freight rate of $1 per ton. Should Lake Superior become closed the coal will be brought to Lake Michigan ports and sent out by rail. Plans for stimulating distribution in this way have been perfected.

The November movement of bituminous coal was the lightest of any month since navigation opened in spring. The receipts aggregate 251,754 tons. Hard coal receipts were more satisfactory, the record being 115,879 tons, or the largest since August, when 119,293 tons were received. With December to hear from, cargo receipts of anthracite sum up 675,843 tons and of bituminous 3,402,883 tons.

The docks are loaded with bituminous coal, with a quiet market for the same. The hue and cry about coal shortage induced many consumers to stock up with rail coal from Illinois and elsewhere, and this measure of preparedness is reflected in the market conditions of the present. Consumers have been supplied with anthracite in a partial way, but unless there is a reasonably substantial increase in receipts before navigation closes, many will be forced to purchase higher-rail coal.

ST. LOUIS

St. Louis presents the worst demoralized coal market that has been experienced in three years. There is a surplus of all coal, with no market at all to absorb it, either steam or domestic. Plenty of equipment, transportation good and prices cut.

The condition of the St. Louis coal market is worse than it has been at any other time in the past three years, everything considered. The weather continues unusually mild and more so perhaps than it has been in any other season for several years. The dealers in St. Louis have about 80,000 tons of coal in storage. The Polar Wave Ice and Fuel Co. has 30,000 tons, and Schroeter Brothers have 15,000 tons. The balance is scattered. In addition to that it is estimated that there is about an additional 100,000 to 150,000 tons in storage by manufacturing plants. Efforts to use up this storage coal have almost entirely shut off mine shipments.

Retail dealers have begun cutting their retail prices. One dealer had his prices cut for a couple of weeks, but another retailer, a subsidiary of the Taylor Coal Co., of Chicago, began cutting the Carterville coal 50c. a ton. The result is that the entire trade cut the price anywhere from 50c. to 75c. a ton, and even at that no coal is moving. A general wave of dissatisfaction has taken possession of the public, and there is considerable criticism because they were induced to put their coal in early at a high price and now there is plenty of coal at a much lower price.

The Standard field is almost shut off on commercial shipments. A good tonnage of railroad coal continues to move out, but this is not what it should be, though it is the only thing that is keeping the mines in the Standard district working. Some mines have had the same coal unbilled now for two weeks. This coal is selling in the St. Louis market at from $1.75 for 2-in. lump up to $2 for 6-in., with nut and egg at about the same price and screenings at from $1.35 to $1.50, with mine-run at $1.65 to $1.70. The operators in this district contend that it costs them between $1.50 and $1.75 to produce coal, so it is a case of where they are down to selling coal at the cost of production or less.

The Mt. Olive field presents a somewhat better condition, although that coal has to some extent been cut to $2.40 and some coal with the Mt. Olive classification in St. Louis is selling as low as $2.25 for the screened domestic sizes. A fairly good railroad tonnage from this field continues to move out and in addition there is a fair demand from the north for coal of this quality, but the mines here are idle on account of no orders and there is considerable unbilled coal.

In the Carterville district of Williamson and Franklin County, as well as in the Duquoin field, there is a surplus of coal at practically all mines, and were it not for the railroad business in these districts the mines would have to shut down on account of no orders. As it is, some mines have unbilled coal right along. Car supply is good and transportation shows a setback the past week or so.

The coals from these fields are holding up fairly well, but they can be purchased as low as $2.40 for the screened sizes, and screenings are a little weak. Very little demand for mine run.

It is a weather proposition from now on. Unless seasonable weather comes a further demoralization of the entire southern Illinois coal business is a certainty.

SEATTLE

Fuel restrictions to be practiced during the winter owing to falling off in production. Thorough investigation made of state coals.

Fuel restrictions will be continued this winter notwithstanding the signing of the peace armistice, according to the state fuel administrator, who states that a falling off in production has made the restrictions necessary and a need to continue the fuel administration office.

The Federal Fuel Administrator for the state, W. W. Miller, is now holding conferences with committees he appointed earlier in the year relative to a series of experiments with Washington coal to find the widest possible use of all grades, and to provide for their utilization in the best way to obtain the greatest saving in consumption and cost. Studies have been made at the mines and in the laboratories, and an interesting report is in the course of preparation by the fuel administration.

During the epidemic of influenza it is now estimated that the output of coal mines in the state fell 60 per cent. for a period of a little more than three weeks, and even yet the mines are not producing what they did previous to the visitation of the sickness.

CURRENT PRICES—MATERIALS & SUPPLIES

IRON AND STEEL

PIG IRON—Quotations (compiled by The Matthew Addy Co.), are f.o.b. cities named, unless noted otherwise.

	Current	One Month Ago
CINCINNATI		
No. 2 Southern	$37.60	$37.60
Northern Basic	34.80	34.80
Southern Ohio No. 2	35.80	35.80
NEW YORK, Tidewater delivery		
Penna. 2X	39.55	39.15
Virginia No. 2	41.70	41.70
Southern No. 2	41.70	41.70
BIRMINGHAM		
No. 2 Foundry	34.00	34.00
PHILADELPHIA		
Eastern Pa. 2X	39.15*	39.15*
Virginia No. 2	40.50†	40.50†
Basic	36.90*	36.90*
Grey Forge	36.90*	36.90*
Bessemer	39.10*	39.10*
CHICAGO		
No. 2 Foundry Local	34.50	34.50
No. 2 Foundry Southern	39.00	39.00
PITTSBURGH, including freight charge from the Valley		
No. 2 Foundry Valley	35.40	35.40
Basic	34.40	34.40
Bessemer	36.60	36.50

*F.o.b. furnace. †Delivered

STRUCTURAL MATERIAL—The following are the base prices, f.o.b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

	Mill Pittsburgh	New York Current	New York One Year Ago	St. Louis	Chicago
Beams, 3 to 15 in.	$3.00	$4.27	$5.25	$4.27	$4.27
Channels, 3 to 15 in.	3.00	4.27	5.25	4.27	4.27
Angles, 3 to 6 in., ¼ in. thick.	3.00	4.27	5.25	4.27	4.27
Tees, 3 in. and larger	3.05	4.27	5.30	4.27	4.27
Plates	3.225	4.77	10.00	4.52	4.52

BAR IRON—Prices in cents per pound at cities named are as follows:

Pittsburgh	St. Louis	Denver	Birmingham
3.50	4.50	4.85	4.47

NAILS—Prices per keg from warehouse in cities named:

	Mill Pittsburgh	St. Louis	Denver	Chicago	Birmingham	San Francisco	Dallas
Wire	$3.50	$4.37	$5.11	$4.32	$4.75	$5.35	$4.75
Cut	4.00	6.50	5.61	4.47	.....	5.75	.....

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh	Cincinnati	Chicago	St. Louis	San Francisco	Birmingham	Denver
Standard railroad spikes ⅜-in. and larger	$3.90	$6.00	$4.50	$5.30	$6.70	$6.00	$5.55
Track bolts	4.90	8.90	5.50	Prem.	8.00	8.00	6.55
Standard section angle bars	3.25	....	4.45	Prem.	5.15	....	4.95

COLD DRAWN STEEL SHAFTING—From warehouse to consumers requiring fair-sized lots, the following discounts hold:

Cincinnati	Cleveland	Chicago	St. Louis	Denver	Birmingham
17½%	List	+10%	+15%	+30%	+30%

HORSE AND MULE SHOES—Warehouse prices per 100 lb. in cities named:

	Mill Pittsburgh	Cincinnati	Chicago	St. Louis	Denver	Birmingham
Straight	$6.25	$7.25	$6.50	$6.25	$8.00	$7.25
Assorted	6.40	7.75	6.50-7.00	6.40	8.25	7.50

Cincinnati—Horseshoe nails sell for $4.50 to $5 per 25-lb. box.

CAST-IRON PIPE—The following are prices per net ton for carload lots:

	New York Current	New York One Month Ago	New York One Year Ago	Chicago	St. Louis	San Francisco
4 in.	$70.70	$70.70	$59.50	$69.80	$63.00	$85.50
6 in. and over.	67.70	67.70	56.50	66.80	60.00	82.50

Gas pipe and 16-ft. lengths are $1 per ton extra.

STEEL RAILS—The following quotations are per ton f.o.b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh Current	Pittsburgh One Year Ago	Chicago Current	Chicago One Year Ago
Standard Bessemer rails	$57.00	$38.00	$67.00	$38.00
Standard openhearth rails	55.00	40.00	65.00	40.00
Light rails, 8 to 10 lb.	*3.135 (100 lb.)	43.50	*3.135 (100 lb.)	43.50
Light rails, 12 to 14 lb.	*3.09½ (100 lb.)	49.00	*3.09 (100 lb.)	49.00
Light rails, 25 to 45 lb.	*3.00 (100 lb.)	30.00	*3.00 (100 lb.)	30.00

*Government price per 100 lb.

OLD MATERIAL—The prices following are per gross ton paid to dealers and producers in New York. In Chicago and St. Louis the quotations are per net ton and cover delivery at the buyer's works, including freight transfer charges:

	New York	Chicago	St. Louis
No. 1 railroad wrought	$30.50	$26.50	$33.00
Stove plate	22.00	23.00	25.50
No. 1 machinery cast	33.00	26.00	20.50
Machine shop turnings	16.00	13.50	18.50
Cast borings	16.00	13.50	18.50
Railroad malleable cast	30.00	29.00	32.00

COAL BIT STEEL—Warehouse price per pound is as follows:

New York	Cincinnati	Birmingham	St. Louis	Denver
$0.12	$0.16½	$0.18	$0.19	$0.18½

DRILL STEEL—Warehouse price per pound:

	New York	St. Louis	Birmingham
Solid	16c.	16c.	15c.
Hollow	24c.	...	...

PIPE—The following discounts are for carload lots f.o.b. Pittsburgh; basing card of Nov. 6, 1917, for steel pipe and for iron pipe:

BUTT WELD

Inches	Steel Black	Steel Galvanized	Inches	Iron Black	Iron Galvanized
⅛, ¼ and ⅜	44%	17%	½ to 1¼	33%	17%
½	48%	33⅓%			
¾ to 3	51%	37½%			

LAP WELD

2	44%	31⅓%	2	26%	12%
2½ to 6	47%	34½%	2½ to 4	28%	15%
			4½ to 6	28%	15%

BUTT WELD, EXTRA STRONG PLAIN ENDS

⅛, ¼ and ⅜	40%	22½%	½ to 1¼	33%	18%
½	45%	36½%			
¾ to 1¼	49%	36½%			

LAP WELD, EXTRA STRONG PLAIN ENDS

2	42%	30½%	2	27%	14%
2½ to 4	45%	33½%	2½ to 4	29%	17%
4½ to 6	44%	32½%	4½ to 6	28%	16%

From warehouses at the places named the following discounts hold for steel pipe:

	Black New York	Black Chicago	Black St. Louis
⅛ to 3 in. butt welded	40%	41.1%	40%
3½ to 6 in. lap welded	36%	37.1%	36%

	Galvanized New York	Galvanized Chicago	Galvanized St. Louis
⅛ to 3 in. butt welded	28%	26.1%	27%
3½ to 6 in. butt welded	25	23.1%	24%

Malleable fittings. Class B and C, from New York stock sell at list + 15%. Cast iron, standard sizes, 5% off.

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York and St. Louis
Galvanized iron rigging	+20%
Galvanized cast steel rigging	List
Bright plain rigging	30%
Bright cast steel	17½%
Bright iron and iron tiller	5%

STEEL SHEETS—The following are the prices in cents per pound from jobbers' warehouse at the cities named:

	Pittsburgh Mill, in Carloads	New York Current	New York One Month Ago	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
*No. 28 black	5.00	6.52	6.495	9.50	6.42	8.50	6.52	9.25
*No. 26 black	4.90	6.40	6.395	9.40	6.32	8.40	6.42	9.15
*Nos. 22 and 24 black	4.85	6.37	6.345	9.35	6.27	8.35	6.37	9.10
Nos. 18 and 20 black	4.80	6.32	6.295	9.30	6.22	8.30	6.32	9.05
No. 16 blue annealed	4.45	5.72	5.695	10.20	5.62	8.70	5.72	9.70
No. 14 blue annealed	4.35	5.62	5.595	10.10	5.52	8.60	5.62	9.60
No. 10 blue annealed	4.25	5.42	5.495	10.00	5.42	8.50	5.52	9.50
*No. 28 galvanized	6.25	7.77	7.745	11.00	7.67	10.00	7.77	10.50
*No. 26 galvanized	5.95	7.47	7.445	10.70	7.37	9.70	7.32	10.20
No. 24 galvanized	5.80	7.32	7.295	10.55	7.22	9.55	7.47	10.05

* For painted corrugated sheets add 30c. per 100 lb. for 25 to 28 gage; 25c. for 19 to 24 gages; for galvanized corrugated sheets add 5c., all gages.

SHOP SUPPLIES

NUTS—From warehouse at the places named, on fair sized orders, the following amount is deducted from list:

	New York Current	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
Hot pressed square	$0.80	List	$1.25	$1.30	$0.98	$2.00
Hot pressed hexagon	.80	List	1.05	1.30	.78	2.00
Cold punched square	2.50*	List	.75	List	1.00	1.50
Cold punched hexagon	2.50*	List	.75	List	1.00	1.50

* List plus.

Semi-finished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York	40—10%	50%
Chicago	50%	45%
Cleveland	50—10%	50%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
½ by 4 in. and smaller	40—10%	40—10%	37%
Larger and longer up to 1 in. by 30 in.	20—5%	20—5%	25—5%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:
New York.....$2.00 Cleveland.....List Chicago.....$2.50

For cast-iron washers the base price per 100 lb. is as follows:
New York.....$6.00 Cleveland.....$4.25 Chicago.....$4.50

RIVETS—The following quotations are allowed for fair sized orders from warehouse:

	New York	Cleveland	Chicago
Steel ½ and smaller	40%	45—5%	40%
Tinned	30%	45—5%	40%

Biloer, ½, ¾, 1 in. diameter by 2 in. to 5 in. sell as follows per 100 lb.:
New York..$5.675 Cleveland...$5.15 Chicago....$5.67 Pittsburgh...$4.65

Structural, same sizes:
New York..$5.775 Cleveland...$5.25 Chicago....$5.77 Pittsburgh...$4.75

CONSTRUCTION MATERIALS

LINSEED OIL—These prices are per gallon:

	New York Current	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
Raw in barrel	$1.59	$1.25	$1.90	$1.25	$1.77	$1.22
5-gal. cans	1.84	1.35	2.00	1.40	1.97	1.32

* Nominal.

WHITE AND RED LEAD in 500-lb. lots sell as follows in cents per pound:

	Red Current Dry	Red Current In Oil	Red 1 Year Ago Dry	Red 1 Year Ago In Oil	White Current Dry and In Oil	White 1 Year Ago Dry and In Oil
100-lb. keg	14.00	14.50	12.25	12.50	14.00	12.50
25 and 50-lb. kegs	14.25	14.75	12.50	12.75	14.25	12.75
12½-lb. keg	14.50	15.00	12.75	13.00	14.50	13.00
5-lb. cans	.....	.....	14.25	14.00	16.00	14.50
1-lb. cans	.....	.....	14.25	14.50	17.00	14.50

COMMON BRICK—The prices per 1000 in cargo or carload lots are as follows:

Cincinnati	$16.75	Birmingham	$15.00
St. Louis, salmon	12.00	Denver	12.00

PREPARED ROOFINGS—Standard grade rubbered surface, complete with nails and cement, costs per square as follows in New York, St. Louis, Chicago and San Francisco.

	1-Ply C.l.	1-Ply L.C.l.	2-Ply C.l.	2-Ply L.C.l.	3-Ply C.l.	3-Ply L.C.l.
No. 1 grade	$1.45	$1.70	$1.85	$2.10	$2.25	$2.50
No. 2 grade	1.30	1.55	1.65	1.90	2.00	2.25

Asbestos asphalt saturated felt (14 lb. per square) costs $5.35 per 100 lb.

Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs per $2.40 roll in carload lots and $2.65 for smaller quantities.

Shingles, red and green slate finish cost $5.75 per square in carloads, $6.75 in smaller quantities, in Philadelphia.

ROOFING MATERIALS—Prices per ton f.o.b. New York or Chicago:

	Carload Lots	Less than Carload Lots
Tarfelt (14 lb. per square of 100 sq.ft.)	$64.00	$65.00
Tar pitch (in 400-lb. bbl.)	21.00	22.00
Asphalt pitch (in barrels)	40.00	45.50
Asphalt felt	72.50	77.00

HOLLOW TILE—Price per block in carload lots for hollow building tile:

	4x12x12	8x12x12	12x12x12
St. Paul	$0.056	$0.11	$0.162
Cincinnati	.086	.165	.218
Seattle	.09	.175	.30
Los Angeles	.0668	.12	.20
New Orleans	.14	.20	.29
Pittsburgh	.....	.14	...

LUMBER—Price of yellow pine per M in carload lots:

	1-in. Rough 10 In. x 16 Ft.	2-In. T. and G. 10 In. x 16 Ft.	8 x 8 In. x 20 Ft.
St. Louis	$39.00	$34.00	$36.00
Birmingham	33.00	33.00	28.50
Denver	43.25	35.00	43.00
Cincinnati	43.00	42.00	37.00

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25-lb. keg for black powder:

	Low Freezing 20%	Gelatin 40%	Gelatin 60%	Gelatin 80%	Black Powder
New York	.....	0.31½	$0.38½	.....	$2.50
Boston	$0.25½	.28½	.35½	$0.42½	2.50
Cincinnati	.19½	.23½	.29½	.....	2.45
Kansas City	.21½	.27½	.34½	.44½	2.55
New Orleans	.21½	.28½	.35½	.45½	2.70
Seattle	.....	.25½	.32½	.....	...
Chicago	.19½	.23½	.34	.44	2.45
St. Paul	.20	.27½	.34½	.....	2.55
St. Louis	.20	.27½	.34½	.44½	2.15
Denver	.18½	.26	.33	.43	2.50
Dallas	.25	.33½	.40	.50	.....

MISCELLANEOUS

GREASES—Prices are as follows in the following cities in cents per pound for barrel lots

	Cincinnati	St. Louis	Birmingham	Denver
Cup	7.2—8.2	6.9	8½	14½
Fiber or sponge	7.2—8.2	13	8½	18
Transmission	7.2—8.2	13	0	20
Axle	4.6—4.9	3.9	3¾	5½
Gear	4.9—7.1	9.5	8	9
Car journal	4.9	4.5	5	8

BABBITT METAL—Warehouse prices in cents per pound:

	New York Current	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
Best grade	95.00	70.00	83.00	80.00	96.00	70.00
Commercial	45.00	40.00	23.00	21.00	25.00	25.00

HOSE—Following are prices of various classes of hose:

Fire

	50-Ft. Lengths
Underwriters' 2½-in	85c. per ft.
Common, 2½-in	25%

Air

	First Grade	Second Grade	Third Grade
¾-in. per ft	$0.65	$0.40	$0.30

Steam—Discounts from list

First grade.....15% Second grade..... 25% Third grade.....33⅓%

LEATHER BELTING—Present discounts from list in cities named:

	Medium Grade	Heavy Grade
St. Louis	30–50%	35%
Denver	35–5%	40%
Birmingham	35%	40%
Chicago	45%	35%
Cincinnati	40–10%	30%

RAWHIDE LACING—25% off list.

PACKING—Prices per pound:

Rubber and duck for low-pressure steam	$0.99
Asbestos for high-pressure steam	1.76
Duck and rubber for piston packing	1.10
Flax, regular	.99
Flax, waterproofed	1.21
Compressed asbestos sheet	1.10
Wire insertion asbestos sheet	1.30
Rubber sheet	.66
Rubber sheet, wire insertion	.99
Rubber sheet, duck insertion	.55
Rubber sheet, cloth insertion	.25
Asbestos packing, twisted or braided, and graphited, for valve stems and stuffing boxes	1.21
Asbestos wick, ½- and 1-lb. balls	.75

MANILA ROPE—For rope smaller than ¾-in. the price is ½ to 2c. extra; while for quantities amounting to less than 600 ft. there is an extra charge of 1c. The number of feet per pound for the various sizes is as follows: ½-in., 8 ft.; ⅝-in., 6; ¾-in., 4½; 1 in., 3½; 1¼-in., 2 ft. 10 in.; 1½-in., 2 ft. 4 in. Following is price per pound for ½-in. and larger, in 1200-ft. coils:

Boston	$0.34	Birmingham	$0.39
New York	.36	Denver	.36
Cincinnati	.33½	Kansas City	.34½
Chicago	.33	Seattle	.33
St. Paul	.34	St. Louis	.33½
San Francisco	.32	Los Angeles	.34

PIPE AND BOILER COVERING—Below are discounts and part of standard lists:

PIPE COVERING Pipe Size	Standard List Per Lin. Ft.	BLOCKS AND SHEETS Thickness	Price per Sq.Ft.
1-in.	$0.27	½-in.	$0.27
2-in.	.36	1 -in.	.30
6-in.	.80	1½-in.	.45
4-in.	.60	2 -in.	.60
3-in.	.45	2½-in.	.75
8-in.	1.10	3 -in.	.90
10-in.	1.30	3½-in.	1.05
85% magnesia high pressure			List
or low-pressure heating and return lines		4-ply	58% off
		3-ply	60% off
		2-ply	62% off

WIRING SUPPLIES—New York prices for tape and solder are as follows:

Friction tape, ⅙ lb. rolls	48c. per lb.
Rubber tape, ⅙-lb. rolls	60c. per lb.
Wire solder, 50-lb. spools	46c. per lb.
Soldering paste, 2-oz. cans	$1.20 per doz.

COPPER WIRE—Prices per 1000 ft. for rubber-covered wire in following cities:

	Denver Single Braid	Denver Double Braid	Denver Duplex	St. Louis Single Braid	St. Louis Double Braid	St. Louis Duplex	Birmingham Single Braid	Birmingham Double Braid	Birmingham Duplex
No. 14	$17.00	$21.00	$39.40	$12.50	$16.00	$30.50	$13.00	$17.40	$36.80
10	25.65	28.90	64.75	27.20	31.00	69.00	21.40	24.40	42.75
8	36.45	40.25	88.45	38.00	42.00	78.00	42.35	44.35	.....
6	57.40	61.70	.....	.....	65.00	130.00	64.60	74.60	.....
4	83.40	88.70	.....	.....	93.00	.....	101.75	106.05	.....
2	126.60	132.80	.....	.....	140.00	.....	151.50	153.00	.....
1	164.15	172.40	.....	.....	182.00	.....	201.00	208.50	.....
0	206.80	206.80	.....	.....	242.00	.....	276.00	285.00	.....
00	278.80	278.80	.....	.....	290.00	.....	317.00	330.00	.....
000	341.65	341.65	.....	.....	360.00	.....	417.00	428.50	.....
0000	417.05	417.05	.....	.....	435.00	.....	516.00	516.00	.....

FREIGHT RATES—On finished steel products in the Pittsburgh district including plates, structural shapes, merchant steel, bars, pipe fittings, plain and galvanized wire nails, rivets, spikes, bolts, flat sheets (except planished), chains, etc., the following freight rates per 100 lb. are effective:

Boston	$0.30	New Orleans	$0.38½
Buffalo	.17	New York	.27
Chicago	.27	Philadelphia	.24½
Cincinnati	.23	St. Louis	.24
Cleveland	.17	St. Paul	.49½
Denver	.99	Pacific Coast (all rail)	1.25*
Kansas City	.59		

Note—Add 3% transportation tax. * Minimum carload, 80,000 lb.